The Builder.

VOL. LXVIII. No. 2720. MARCH 23, 1895

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St. Sophia, Constantinople.

PROBABLY no architectural monument that has ever been erected has aroused so much enthusiasm in ancient times, and so much interest in modern times, as the great church erected under the orders of Justinian at Byzantium. Its constructive design and its place in history have alike conduced to this. As the first complete domed building on a large scale which meets the problem of erecting a circular dome over a square plan, it is a landmark in the history of architectural construction. With no known predecessor in precisely the same manner of construction, and no successor on the same scale, it stands alone, a stupendous effort alike of architectural design and of constructive genius. Whoever was personally responsible for it—for we may take it for granted that Justinian had no part in the matter beyond the comparatively easy one of ordering that something great should be done, and finding the money for it—was one of the world's greatest architects. It has been shown by students of architectural history that the suggestions for the erection of a dome over a square plan came from the East, from Asia Minor and from Persia; but even those who believe most implicitly in the influence of evolution in architecture are unable to point to the remains of any building which, in regard either to size or method of construction, can fairly be called the precursor of St. Sophia. The domes of the Sassanidæ (for we decline to accept M. Dieulafoy's relegation of these remains to the much earlier period of the Achæmenidæ) were but on a small scale, and the corners of the plan were not got over by the employment of the true pendentive, but by squinch arches, and in a half-developed and bungling manner. Other examples, of about the same period perhaps, in Syria, exhibit the still more primitive method of carrying the dome over the angles by obliquely-placed lintels. The Church of SS. Sergius and Bacchus seems in many points an obvious precursor of and (though unintentionally perhaps) preparation for St. Sophia; but there the dome is carried on a series of supports arranged in circular fashion, or at least at the angles of an octagon, and the construction presents no special difficulty. St. Sophia, on a far greater scale than anything which had preceded it, rises up at once a completely and logically-developed domical building, on a system of construction which had apparently never been attempted on a great scale before, and which only great boldness and confidence in himself, and a thorough grasp of the constructive conditions of the problem, could have enabled any architect in that day to adventure upon and to carry out successfully. The name that has come down to us as that of Justinian's architect is Anthemius of Tralles. At this distance of time, and when we are concerned with an age so turbulent in its character, so fantastic and superstitious in its records, it is difficult to know how far one has got or can get at the truth in regard to anything of personal history and character. But Anthemius is the name handed down to us, coupled with vague and half-traditional statements as to his proficiency in mathematics and geometry. Such acquirements at least are germane to the matter in hand; not without mathematical and geometrical knowledge on the part of some one were the pendentives of St. Sophia built out into empty space, and the dome seated upon them. Anthemius is but a name to us: we know nothing of his personality or character; but a name we must have, for if ever any building was a work of personal genius and not (as some do vainly fable) of the instincts of the artisan, that building was St. Sophia; to Anthemius therefore "let us garlands bring."

In a historic sense too there is a peculiar interest attaching to St. Sophia, arising out of the period in which it was built. It is a kind of landmark amid "that loose eternal unrest" which accompanied the slow melting down of the Roman world into the Mediæval. It marked the point at which early Christianity combined the greatest superstition with the most barbaric splendour; the point also in art, when, though the influence of the old Classic forms was still felt, they were being clothed with a new garment of colour and picturesqueness. Instead of the cold but exquisite grace of Greek architecture and detail, instead of the equally cold and much more commonplace art of the Roman, there arose a school which seemed to anticipate the future warmth and glow of Mediæval art while preserving much of the fading grace of Greek art. The union produced a style which was not perfect, but which has been almost unmatched for richness and effectiveness of detail, coupled with a passion for rare and costly material. It is possible that the detail of St. Sophia itself was the cause rather than the effect of the sumptuous taste which became characteristic of Byzantine art. Justinian was anxious to hand down his name in connexion with a building unmatched for splendour, and as an irresponsible and unscrupulous ruler he had ample command of funds. And the public of his day was exactly in the state of mental and religious culture to be specially attracted by material splendour in a place of worship. Learning and philosophy were nearly dead, society was in process of relapsing into barbarism, violence and massacre were almost every-day occurrences; and a great church decorated with lavish splendour seemed by contrast a kind of celestial vision, a heaven on earth. Thus it came to pass that St. Sophia elicited, from contemporary or immediately succeeding writers, an amount of rapturous eloquence such as no other building on earth, as far as we know, has ever called forth. The appearance of the dome "as if hanging in the air," the effect of the profusion of coloured marbles on the walls and floor, the glories of the lighting, by silver lamps hanging in chains from the circumference of the dome, or by standards with the lights arranged in pyramidal form, all these and other splendours roused writers like Paul the Silentiary and Procopius to rhapsodies in which legend and fancy are evidently a good deal blended with fact, and which are naïve and childlike in their style, but which nevertheless indicate the existence of no ordinary splendour in the interior effect of the building, and of an extraordinary enthusiasm which the contemplation of it aroused in the minds of the spectators.

The descriptions of Procopius and of Paul the Silentiary* are well known to archæologists, and they need not detain us here, unless for an occasional reference in regard to facts of construction on which they seem to throw light. In the book on St. Sophia produced by Mr. W. R. Lethaby

* The Silentiaries were officials of the Imperial Court.

and the late Mr. Harold Swainson* (to whose untimely and lamented death, shortly after the publication of the work of which he was joint author, reference has already been made in our columns), the most important portions of these contemporary descriptions are translated and brought within the reach of a larger circle of readers than heretofore. It is only necessary to observe that though Procopius professes to be the practical and prosaic historian, his account is padded with legend, and with impossible statements as to Justinian's personal part in the direction of the work, which are mere barefaced flattery, and that his occasional efforts to give some practical information as to the construction of the building only serve to indicate that he neither understood it himself nor was capable of putting his own hazy ideas on the subject into intelligible shape. On the other hand, the Silentiary, who was a poet and put his description into poetic form, evidently describes very carefully, in his own way, what he saw, and wrote his poem on the basis of a minute interior survey of the building, and his account is therefore of considerable historical value, besides the interest attaching to it as an expression of the enthusiastic admiration of a contemporary, and as a composition containing a good deal of really vivid poetic imagery. The publication of a translation of it here, therefore, ought to add a good deal to the popular interest in the book, and may be an attraction to many readers to whom the more technical portions of the subject dealt with would be hardly intelligible.

It is, however, naturally with these portions that we have mainly to deal here. Mr. Lethaby takes St. Sophia not only as a building of great constructive interest for its own sake, but as a type of Byzantine building and its special methods of design and construction.

St. Sophia was the second church on the site, its predecessor having been wantonly burned on January 15, 532, as the result of an insurrection arising originally out of nothing more than what may be called a "row" at some public games, presided over by the Emperor, between the adherents of two factions among the competitors, the "greens" and the "blues," of whom the ringleaders on either side were executed by Justinian's orders; the remaining factions then banding together to put down the Emperor, sack the town, and crown a new Emperor over its ruins. Justinian's energy and resource are indicated both in the prompt manner in which he suppressed the insurrection and got rid of his proposed rival, and in the fact that the rebuilding of the church on a much greater scale was commenced within six weeks after the destruction of its predecessor, and was completed, according to the most trustworthy account, in about six years, a marvellously short period for those days, in the eleventh year of Justinian's reign. Twenty-one years later an earthquake seriously injured the building, and brought down, among other portions, a great part of the large dome, which had to be rebuilt entirely. What we see now, therefore, is the second dome, which was built after the death of Anthemius; in the main, probably, in accordance with his design. The church was reconsecrated five years afterwards, in the thirty-sixth year of Justinian's reign. That the main idea of Anthemius is retained in the interior as now seen there is no reason to doubt; that it was modified in some respects is implied by the Silentiary, and positively asserted, with some attempt at description of the nature of the alterations, by Agathias, another contemporary historian, whose account is also translated in the book before us. It is of some interest to endeavour to realise what was the nature and extent of this modification.

* "The Church of Sancta Sophia, Constantinople. A Study of Byzantine Building." By W. R. Lethaby and Harold Swainson. Macmillan & Co.: London and New York; 1894.

A plan and section of St. Sophia, to a tolerably large scale, will be found in the *Builder* of February 7, 1891, where they were given as illustrations to Professor Aitchison's valuable Royal Academy lectures on Byzantine architecture. As all our readers know, the main feature in the design is a central dome which is internally a segment rather less than a semi-circle,* and externally is reduced to a considerably smaller segment by the raising of the haunches to form a vertical drum round it, 18 ft. in height, in which the windows are pierced. This formation of an exterior drum, and consequently thickening of the wall near its base, as every architect sees at a glance, is exceedingly important in giving stability to the dome by counterbalancing its outward thrust. This dome, we need hardly remind the reader, stands over four great arches on four sides of a square space, of which those on the north and south are partially filled in with walling and arcades, those on the east and west are open, and are each abutted against on their outer sides by a semi-dome, also in segments less internally than a quarter-circle, and also with the exterior section very much flatter and raised so as to form a semi-drum in such a manner as to thicken the section of walling very greatly at the exterior of the semi-circle. It is to be observed, however, that the segment is smaller in the semi-domes than in the main dome, and the flat appearance of the exterior curve much more noticeable.

The authors draw attention to the fact that Procopius, whose business was to write the history of Justinian's buildings, makes no reference to the earthquake and the catastrophe which it occasioned, and that as his book is supposed to have been issued in the year of the earthquake, it must be taken as describing the building as it existed before that event. This is the more probable, as he specially refers to the destruction of the first church, and the glorious opportunity which it afforded; "God permitted them" (the rioters) "to commit this crime, knowing how great the beauty of this church would be when restored." Had he included the event of the earthquake in his work, he would doubtless have pointed out how this disaster had been permitted by the Divine intervention, to give an opportunity of improving on the first form of the dome. If, therefore, there were in Procopius any definite and detailed description of the dome as he saw it, his evidence would be of considerable value. Unfortunately he deals only in generalities, and gives an intelligible description of nothing, from an architect's point of view; but he does in one place give certain measurements as to heights and widths, which the authors say appear so inaccurate that they do not attempt to explain them. We are inclined to think that these dimensions have been dismissed a little too hastily, and that one or two of them appear to be accurate, and the others might be if we understood exactly what points the writer intended to refer to. The following is the passage as our authors quote it:—

"The length then from the door opposite to the holy apse, where is offered the bloodless sacrifice, to the apse itself is 190 ft.; the breadth of the nave from north to south is 115. The height from the centre of the dome to the ground is 180 ft., and of the arches, the width of each in feet is [no number given], and the length from east to west is 200 ft. The width of the opening is 75 ft."

It is in regard to this last measurement that the authors remark on the futility of trying to explain the meaning of measurements so inaccurate. But the fact is that 75 ft. is, by scale on their own plan on page 38, the width of the space between the east and west piers, the portion occupied by the open arcades at the side; 190 ft. is the length from the inside of the west door to the chord of the eastern semi-dome, which Procopius may have confused with the smaller apse or sacrarium beyond it; and 180 ft. is not far out for the internal height of the present dome. So that in regard to three intelligible points the dimensions seem to be correct. As to whether Procopius's height of the dome is right is an important point in regard to the question of the nature of the alterations which were made after the earthquake. The authors do not, as far as we have been able to find out,* give anywhere an authoritative set of principal measurements, and they have not even a section with a scale attached to it, which is a rather serious omission. Professor Aitchison's scale section in our issue for February 7, 1891, makes the interior height of the dome 177 ft. from the floor of the church. If Procopius's height means from the outer ground line to the outside of the top of the dome, his 180 ft. would be very nearly correct. And his 75 ft. for the "opening," if we take that to mean the space between the north and south piers, is exactly right according to the authors' scale plan. What is curious is that they speak (page 212) of the "arches of 72 ft. span" on the north and south sides, which is incorrect according to their own plan (by scale), while the 75 ft. of Procopius is correct.

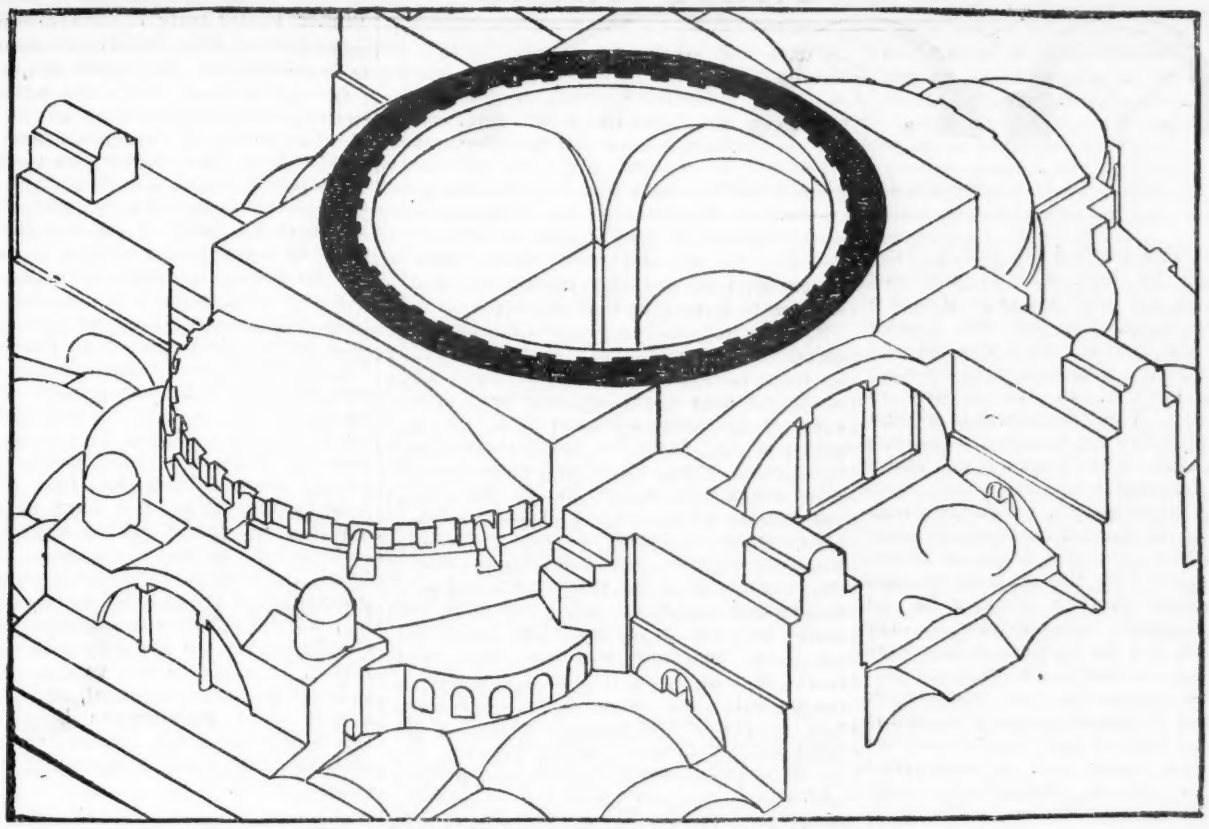
All this bears on the question of the extent and nature of the alterations made in rebuilding the dome after the earthquake. The most detailed description of this is that given by Agathias:

"And as by the earthquake the middle portion of the roof and the higher parts had been destroyed, the king made it stronger, and raised it to a greater height. Anthemius was then dead, but the young man Isidorus and the other craftsmen, turning over in their minds the previous design, and comparing what had fallen with what remained, estimated where the error lay, and of what kind it was. *They determined to leave the eastern and western arches (apsides) as they were.* But of the northern and southern (arches) they brought towards the inside, *that portion of the building which was on the curve.* And they made these arches wider so as to be more in harmony with the others, *thus making the equilateral symmetry more perfect;* in this way they were able to cover the measurelessness of the empty space, and to steal off from its extent *to form an oblong design*, and again they wrought that which rose over it in the middle, whether orb (κύκλος) or hemisphere, or whatever other name it may be called. And this also became more straightforward and of a better curve, in every part agreeing with the line; and at the same time not so wide but higher, so that it did not frighten the spectators as formerly, but was set much stronger and safer."

This is a very curious passage, for it appears self-contradictory. It is stated that the north and south arches were altered to make the symmetry more perfect, and yet, as the corollary of this proceeding, that they made "an oblong design." And this discrepancy is all the more curious, as we shall see just now, when considered in reference to the explanation given on another page by the authors, and partly founded on an observation by Choisy. First, however, in regard to the raising of the dome. It is distinctly said here that the height of the dome was raised, that it was "not so wide but higher," *i.e.* less flat in section. And this indication is confirmed by another contemporary writer, Theophanes, who states that "the emperor restored the piers" (after the earthquake) "and raised the dome twenty feet." It seems impossible to doubt that the dome was raised; that is a plain and easily noticeable fact which would strike even an unlearned spectator, and which was not likely to be overlooked if done, or invented if not done. And there is a point in the existing section of the building which is in favour of the idea that the present central dome was not the original section. A central dome, 20 ft. or 25 ft. lower (for that is the figure given by another witness) than the present one, would assimilate very much in curve and in general effect to the actual treatment of the semi-domes as they now exist. There is a probability that in the first instance the dome and two semi-domes

* The internal diameter of the dome, taken above the cornice, is 108 ft. by scale, according to the section drawn for Professor Aitchison's lectures. It is stated as 104 ft. in the "Dictionary of Architecture." These and other discrepancies may result from the measurement being taken as above or below the cornice, by different writers. Its centre is about 9 ft. below its springing-line.

* It is one of the few faults to be found in the book that it is very deficient in system of arrangement, and it is difficult to know where to look for any particular fact one wants.

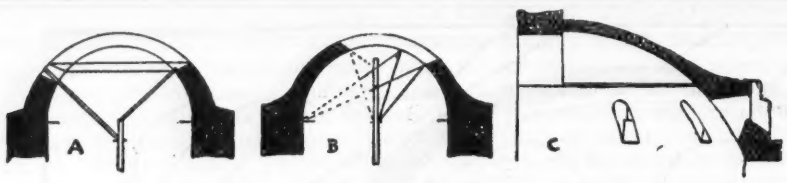


View of Vaulted System of St. Sophia, adapted from Choisy.

would all be designed in the same manner and in the same kind of lines and proportion. Yet it is to be observed that Procopius in his account speaks of "a spherical-shaped dome" (θόλος), which accords much more nearly with the appearance of the existing dome than with the supposed flatter original dome; and moreover, as already observed, he gives the measured height of the dome from the floor as very nearly the same as that of the existing dome. Our conclusion would be that, though Procopius no doubt commenced his description on the church as at first built, yet that the earthquake and the reconstruction having taken place before his account was completed, he mixed up the two in it, and that his description and measurement of dome referred to the existing one. That he should omit any reference to the earthquake is no doubt odd; but, at all events, the supposition we have made reconciles his account and his measurement approximately with facts; whereas, if he had been referring to the first dome, his measurement of height must have been wrong, according to other accounts, by at least 20 ft. He may perhaps have inserted, at the last moment, measurements taken after the rebuilding of the dome.

This, however, is a straightforward and simple matter compared with the question, what was done with the substructure in the rebuilding. In connexion with the northern and southern arches we read in the above quotation that "that portion of the building which was on a curve" at those points, was brought inwards. A curious light is thrown on this by Choisy, who however does not seem to have altogether appreciated the drift of his own discovery. This is illustrated by the perspective drawing of the outside masses of the building and the base of the centre dome, which we borrow from the book, before us, and which is a simplification, with certain modifications, of the elaborate drawing which forms the last plate but one in Choisy's "L'Art de Bâtir chez les Byzantins." Choisy, in examining the external square base of the dome, found that it did not originally form a square, but that it was narrower one way than the other, the circular base of the dome on the north and south projecting beyond the quadrangular mass and forming, as will be seen on the drawing, a "curved wall" outside of it. Choisy's plate makes it a great deal clearer to the eye than this drawing, because he shows it at one angle (next the spectator) as it is here, and at the other angle he shows the mass of masonry which had been added to make the block square and to strengthen the base of the dome. And he says "I verified the entire absence of bond between the first base of the dome and the added work." Here then is a certain explanation of the reference by Agathias to the portion of the building "which was on the curve," and a curious confirmation as to the probable general correctness of the description of Agathias. And Mr. Lethaby (for we may assume that this portion of the book is specially his work) seems to consider that here we have the key to the mystery. The lateral walls of the church, between the piers, were formerly as far back as what he calls the secondary order of arches in the galleries, those which stand about 12 ft. back from the front of the gallery, and thus left an upper gallery 12 ft. wide and 72 ft. long (75 ft.?) open to the interior. The arch over this space, between the great north and south piers, would be really a wide barrel vault 12 ft. in depth. When the dome was rebuilt, the present front arcaded screens were built in flush with the square over which the dome stands, and the cross width of the church thus reduced, while above the impost level of the great piers a shallow arch was introduced of the same size as the east and west arches, thus, as Agathias says, "making the equilateral symmetry more perfect." This does not, however, clear up all discrepancies, because Agathias says that the dome was "not so wide but higher" than it was before. It is impossible to see how this could have been, since he expressly says (and no one can doubt) that the eastern and western arches under the dome were "left as they were," and as the dome now comes close upon them, it could never have been wider than it now is. But the filling up of the north and south arches would give a firmer base for the dome at the sides, and by reducing the visible width of the interior would, as Agathias implies, reduce the alarming appearance of the extent of space to be covered and re-assure the mind of the spectator to some extent; but it is impossible that the dome itself could have been reduced in diameter, on account, as just observed, of its present relation to the eastern and western arches. Another apparent discrepancy is in the remark of Agathias that they were thus able "to steal off some of its extent to form an oblong design." The fact is that, if we accept (as we are inclined to do) Mr. Lethaby's explanation, the design of the centre of the church was oblong *before* the north and south screen arcades were built in—the clear central space was wider across than it was in length, whereas by the alteration it was made perfectly square. We suspect either the reading or the translation of Agathias is wrong, and that what he really said or meant to say was that the architects, in making the alterations, took off some of the extent (of open space) which *had* given it an oblong appearance. Apart from these discrepancies, Mr. Lethaby's suggestion as to what was really done on the north and south sides, in the rebuilding, seems a very probable one and fairly explains the meaning of the historian. The precise truth we could learn, perhaps, in one way only, by taking down the building stone by stone, when very probably evidence of all the process it went through would be discovered; but that is a method of investigation not open to us.

One of the points which the authors have gone into at some length is the method of construction of Byzantine domes and vaults, and of those of St. Sophia especially. The authors adopt fully the opinion of Choisy, that the object of the Byzantine builders was to erect domes and vaults as far as possible without scaffolding, though they differ from him to some extent in regard to the method in which the vaults were carried out. M. Choisy supposes the curve of intersection of the diagonal over the plan designed as a segment of a circle; "then he considers all sections of each compartment of the vault, taken parallel to its arch, and therefore perpendicular to its axis, to be also segments of circles springing from a series of points on the diagonals, these centres being the axis of each vault." But, as the authors point out, such a system would certainly necessitate a centreing for the diagonal rib in the first instance, and therefore is hardly in accordance with the idea that the object of the Byzantines was to avoid the use of



Eastern Dome Construction.

centreing. The method by which barrel vaults could be built without centreing, with rings of flat brick on edge placed at an oblique angle, the last one finished supporting the next one till it was finished, was shown in the illustrations to Professor Aitchison's lectures, in the *Builder* of March 7, 1891. The principle, it is evident, might be applied to the construction of cross vaults also, if not of too large a span; and in Byzantine building cross-vaults are never used for the larger spaces, which are always domed. For the manner in which this cross vaulting without centreing might be carried out, as suggested by the authors, we must refer the reader to their diagram No. 40, and the explanation accompanying it. The system could not be applied to any vault of which the brickwork or masonry was to be visible afterwards—the result would be too clumsy in appearance for that. But in the Byzantine form of vault the intersections are blunt, the upper part of each compartment is almost domical in form, "and the forms are further softened by every edge of arch and vault being rounded, so that the mosaic completely envelops the whole like a vast embroidered gold tissue."

With the dome it is of course a much simpler matter. The authors refer to Choisy's opinion that the great dome of St. Sophia may have been built in the air without centreing. We agree with the authors in thinking that there must have been a light centreing for the crown of the dome, supported on what had been already built, in order to close the opening; we can hardly conceive of such an expanse of flat arch being erected in any self-supporting manner, seeing that in the crown of the dome, at any rate, the joints must have been arranged normal to its curve. But as to the great portion of the lower part of the dome, with the employment of large flat bricks and keeping the joint-lines considerably more horizontal than with the ordinary joint radiating from the centre,* there need have been no difficulty, or at all events no impossibility, in constructing the greater portion of such a dome without any scaffolding, building it up as it went on. There is certainly something grand and fascinating in this independent method of building, making the materials carry themselves as they go up, and it perhaps more distinctly merits the title of "building," in the truest sense, than the operation of constructing an elaborate temporary timber building to erect the permanent structure upon.

While on the subject of doming the authors refer to a simple method used in the East for guiding and defining the interior and exterior surfaces in dome-building, which is illustrated in the annexed cut. A vertical pole is set in the centre of the space, with a rod at the top free to move in all directions, which defines the outer surface of the dome, while another rod fixed below it, the centre of a larger circle, defines the flatter exterior curve. The scheme B is one suggested by Choisy, on a somewhat similar principle, for also regulating the pitch of the joints of the dome courses where, for constructional purposes, they are not desired to radiate from the centre.

There is so much to notice in this book in regard to other points in St. Sophia, and the subject is of such interest in itself, that we shall devote another article to it.

* See a diagram of arches with radiating and with flatter courses in *Builder*, March 7, 1891, page 189.

NOTES.

THE Architectural Room of the Spring Exhibition at the Walker Art Gallery, Liverpool, presents some novel features. For the first time perhaps in England an attempt has been made to hold an exhibition of architectural drawings which shall possess some practical value. The "perspective" which figures annually at Burlington House is, it is true, to be seen here, but, by the special regulations, it must be accompanied by a plan. This is, at least, a step in the right direction. Still better is the admission of drawings to scale mounted on strainers or framed and glazed. Photographs of executed work, if with plans attached, were also admitted. The exhibition, consequently, is one which, although it may not appeal to the general public—it cannot, however, attract less than the Architectural Room at the Academy—is of considerable interest, not only to architects, but also to artisans and others who can understand plans and geometrical drawings. The room devoted to it is considerably larger than that at the Royal Academy, and contains over two hundred drawings, photographs, &c. Really there are considerably more, as a strainer, counted as one exhibit, often contains half-a-dozen drawings. Mr. J. Belcher sends his design for the completion of South Kensington Museum, including plan, elevation, perspective, and the splendidly-drawn detail drawing of a portion showing the dome, half elevation, and half section. The same architect also sends elevations of the two sides of his building for the Chartered Accountants, and a plan of the same. Messrs. Bodley Garner are largely represented, their exhibits including the designs for Pendlebury Church, Manchester, Clumber Church for the Duke of Newcastle, and the exterior and interior of the proposed cathedral at Liverpool. Perhaps the most interesting set of drawings in the room is that contributed by Mr. Halsey Ricardo. In every case, for each separate work, he sends plans and elevations drawn to scale, and well drawn too, as well as a perspective or a photograph. Equally thorough and complete is Mr. W. D. Caröe's contribution. Interesting drawings, more or less known, are also sent by Messrs. Paley & Austin, Basil Champneys, Leonard Stokes, Reg. Blomfield, Chas. J. Ferguson, E. Newton, A. H. Skipworth, F. Inigo Thomas, W. F. Unsworth, Walter Millard, E. W. Mountford, and others. Mr. A. B. Pite and Mr. E. P. Warren send photographs of executed work. The local architects are not strongly represented. Messrs. Grayson & Ould send two drawings; Mr. Edmund Kirby two and a photograph; and Mr. Huon A. Matear two, of which one is an exceedingly well-drawn perspective of a church, which, however, reminds one considerably of Mr. H. Wilson's powerful design for the cathedral at Victoria, B.C. In all cases, or nearly all, all works sent by any one architect are hung together. Altogether the exhibition is a step in the right direction, and we only wish the Royal Academy would take a hint from it.

THE deputation from the Association of Sanitary Inspectors, which had an interview last week with Sir Walter Foster, the Vice-President of the Local Government Board, obtained no promise of any legislative assistance from the Government either towards the increase of the pay of sanitary inspectors or towards the making of their office more secure in tenure. Sir Walter Foster truly enough observed that these matters were really in the hands of the local authorities, by whom inspectors are appointed and paid. Without a radical change in the present tenure of the office—without, in fact, transferring the appointment of these officers from local authorities to the Local Government Board, it is difficult to see how their position can be appreciably improved. There is no doubt at all that the present mode of appointment renders it more difficult for proper inspection to take place. It is natural that men should not wish to offend their masters and their neighbours. The local sanitary inspector, if he does his duty firmly and vigorously, has one day to make complaint against some person with whom he is brought in daily contact, and, it may be, the next to condemn the cottage of some member of the District Council. There is no task more difficult than that which now falls to the lot of the local sanitary inspectors, and public opinion should support their action on every occasion. Unfortunately the average local opinion on sanitary matters is not yet so enlightened as it should be; when a vigorous sanitary inspector constantly carries out his duty without fear or favour, he is apt to receive discouragement rather than encouragement, and to be regarded as a meddlesome busybody who fusses about trifles, rather than as an efficient officer doing a good and necessary public service.

A CORRESPONDENT on Monday last published a letter in the *Times* in which he stated how towards the end of last week he visited Putney and Wandsworth, and saw portions of main water pipes being removed filled with solid ice, and how on measuring the depth of these pipes he found that the upper part was barely 15½ in. below the surface. That in the suburbs of London many of the water-pipes — the property of the water companies—have been laid at an insufficient depth there can be no doubt. Immediately above the letter was one from Mr. Archibald Dobbs, who knows more about the law relating to the London water companies than most men. In this he states it to be his opinion that owing to the wording of the Act of Parliament the water companies are exempt from any liability for an insufficient supply or for an absence of water when such supply is "prevented by frost." Secondly, Mr. Dobbs is of opinion that there is no legal power to compel a water company to erect stand-pipes during a frost. It is clear, therefore, that the public are wholly in the power of the companies. The Acts have been so framed that the monopoly held by these companies for the public benefit is, in the eye of the law, something for the benefit in the first place of the companies. This is a good illustration of the antagonism which must always prevail between public and private interests when the water-supply of a community is not in the hands of a public body, bound to look primarily to the public good. The obvious moral is that the law should be at once amended by making the water companies liable to heavy penalties if from any cause the supply of water is stopped. It is useless to wait for a possible transfer of the water companies to the London County Council or to some other body. Such an Act should be passed at once; it need only be a few lines in length, and even if later on in the season —which, however, is doubtful—the London County Council should become the water authority, the Act, with some verbal amendments, will be of value, since it does not follow that it may not be necessary to enforce the law against a public authority.

WE greatly regret to see the announcement of the death at a comparatively early age (51) of Mr. Ernest Turner, an

architect who has done so much excellent work in furthering the cause of sanitary building and improved drainage, on which subject he had long been recognised as one of the most capable experts of the day. We may be able to give some detailed account of his work in another issue. It will be remembered that he took a prominent and energetic part in the organisation and working of the Hygienic Congress in London, when his business-like habits coupled with his thorough sanitary knowledge, rendered his co-operation especially valuable.

"THE Scott-Moncrieff System of Sewage Purification by Micro-Organisms," or, as it used to be termed, "The Scott-Moncrieff System for the Bacteriological Purification of Sewage," has now passed the experimental stage, and has been put to the test of actual practice, although not on a large scale. We have already explained the principles underlying the system,* and need only say now that its aim is to effect the purification of sewage by hastening and controlling the development of non-pathogenic micro-organisms in the sewage, whereby this is decomposed and (it is hoped) rendered innocuous, without the slightest depreciation of its manurial value. The process is simply an acceleration (under proper control) of Nature's methods of purification, namely, putrefaction and nitrification, and this fact alone seems to warrant considerable hope of ultimate success. Another pamphlet containing recent reports on the system has just reached us. Dr. G. Sims Woodhead, a well-known bacteriologist, and director of the Research Laboratory of the Royal Colleges of Physicians and Surgeons, speaks favourably of it. So also does Dr. Rideal, Examiner in Chemisty at the Royal College of Physicians; and favourable comments by a Medical Officer of Health, a civil engineer, and an architect (Mr. Philip Webb), are also printed, together with four testimonials respecting the actual working of the process at Eastwell Park (Kent), Oxshott (Surrey), and Westbrook (near Horsham). The system has also been adopted at Towcester on a somewhat larger scale, with apparent success. We notice that the opinion which we expressed in September last—that a greater depth of filtering medium would be found necessary — has proved correct, for the drawings which reached us with the new pamphlet show a depth of filtering medium of about 28 in., or double the depth which Mr. Scott-Moncrieff at that time considered sufficient. Several other modifications have also been effected. The great question which now remains to be answered is this:—Does the system ensure the destruction of all pathogenic bacilli? On this point the evidence is far from clear. Dr. Woodhead's statement is very guarded, and although Dr. Rideal is a little more explicit, even he apparently is not quite satisfied. Meanwhile, the system will be found useful for treating the sewage from country houses, and other more or less isolated buildings, under normal conditions; but at present it will not be safe to trust to the process for the destruction of bacilli arising from infectious diseases. It is possible that the "cultivation" filter-beds may prove favourable to the development of some pathogenic organisms, as well as of the non-pathogenic forms which are necessary for the purification of the sewage.

THE "Benardos" process of electric welding is gradually coming into favour in this country for repairing boilers and machinery. Several large mills have laid down special plant for it, and rapid repairs made by this method have given the greatest satisfaction. The weld is made by means of a rod of carbon fixed in a special holder and held by the workman, the heat formed by the arc between the carbon and the metal producing the required weld. The eyes are, of course, thoroughly protected from the blinding light produced, and it is found necessary to protect the face also, otherwise the light would cause an inflammation of the skin very similar to a severe sunburn. When the carbon pencil and the metal are brought together an arc is struck and the metal in contact with the arc is melted. If the metal be poured away a hole is soon made, and by moving the arc along a slit can be made in the metal so that it can be used for rough boring. Broken eccentric rods, crank shafts, &c., can be welded without any very special skill of hand or eye, whilst the teeth of cast steel wheels can be replaced without the trouble of taking the wheels off the shaft. Perhaps its most useful application is in filling up cracks in bars or sheets of steel. Lumps of mild steel are placed in the crack and melted by the electric arc, the resulting weld in most cases answering excellently. As the electric pressure is very small there is no danger of the workman getting unpleasant shocks, and he can sit or lie on the article he is mending. For working in awkward places this is a very great convenience, and the rapidity with which repairs can be made is very important where time is a primary consideration.

* See the *Builder* for October 1, 1892, page 256, and September 8, 1894, page 168.

BUTE HOUSE, Petersham, for whose building materials tenders have been invited, is so named from having formed a residence of the Earls of Bute; and members of that house are buried in the church there. Its history is closely allied with those of the neighbouring Sudbrook Park, which belonged to John, second Duke of Argyll, and Ham House, his and his brother's birthplace. The latter, built by Sir Thomas Vavasour for, it is said, Henry, Prince of Wales,* was granted to his brother Charles, who in 1637 gave a lease to William Murray, Lord Huntingtower and Earl of Dysart, whose elder daughter and heir, Elizabeth, Countess of Dysart, brought it in marriage to Sir Lionel Tollemache, of Helmingham, Bart. (ancestor of the Earls of Dysart). Their daughter Elizabeth married Archibald, first Duke of Argyll. Of the issue by that marriage the two sons were John and Archibald, who succeeded as second and third Dukes, and Anne, who married James Stuart, second Earl of Bute, *obiit* 1732. John, fourth Earl, whose father, the celebrated Minister, was Ranger of Richmond Park, was advanced Marquis of Bute in 1796. George I. permitted John, Duke of Argyll, to enlarge Sudbrook by taking part of Richmond Park, when perhaps that piece of Charles I.'s wall was taken down. After the death of Sir Robert Wilmot-Horton, Sudbrook Park was bought by the Crown for a total cost of 34,856*l.*, and of its 130 acres twenty were added to Richmond Park, being, we believe, the portion of hill-side between Ham Gate and Pembroke Lodge, granted to the Duke. A proposal, four years ago, to place Sudbrook Park in the building market, occasioned considerable opposition by the inhabitants around, and several bodies concerned in the preservation of open spaces. Petersham is identified with the Patriceshã of Domesday, which describes it as being in Kingston hundred and belonging to the abbots of Chertsey, in whom it continued until 1415, when Abbot Thomas conveyed it to Henry V. With Ham and Sheen it belonged to Anne of Cleves, who gave the three to Edward VI. The church, successor to that cited in Domesday, was rebuilt in 1515. There were buried Vancouver, the voyager, Agnes and Mary Berry (1852), Walpole's correspondents, and Mortimer Collins.

THE death of Mr. Alfred D. Fripp removes from the list of members of the Royal Society of Painters in Water-colours one whose drawings have been familiar to the frequenters of the Society's exhibitions for very many years. Mr. Alfred Fripp's works represented to the last the traditions of a school which may now be regarded as belonging to the past. They look somewhat weak now, beside the works of artists who have acquired both a broader and more powerful style and handling, and a deeper insight into the spirit of natural landscape, and it is undeniable that they were characterised by very recognisable mannerism. But it was a mannerism with so much charm about it that the interest of his works quite survived that of some other old mannerists of the Society. One could always recognise his subjects and treatment at a glance, but they were always pleasant to look at, and were characterised by a delicate effect of light and colour which was not exactly nature, but was a very pretty translation of nature into the special mood of the artist. Occasionally he rose above this level, and surprised one by a remarkable vividness of aërial effect. His subjects were generally from the sea-coast, and almost always under bright light. Within his own domain he was always a careful and painstaking artist, nor did advancing years seem to impair his work at all; indeed one of the most striking drawings of his that we have ever seen—an Isle of Wight subject, if we remember right—was in a quite recent exhibition.

* Completed in 1610. Thoroughly restored in 1889-90 by Mr. H. R. Franklin, of Deddington, builder, under Messrs. Bodley & Garner's superintendence. See also our "Note" of October 10, 1891.

THE letter which has been addressed by Dr. Rowand Anderson to the directors of the North British Railway Company, in reference to the competition for their new hotel and station offices, and which we print in another column, speaks for itself. Six professional men were invited to compete for a very large building and under very minute instructions, and involving an amount of labour which may be estimated from Dr. Anderson's mention of the fact that his plans occupied himself and twelve assistants working extra hours for eight weeks. The directors, without any professional help, settled their minds on these six elaborate sets of drawings in one day, and the selected set are, we believe, by the engineer to the company. *Quid apertius?*

THE ARCHITECTURAL ASSOCIATION:

IRON AND BRASS.

THE ordinary fortnightly meeting of the Architectural Association was held on the 15th inst. in the meeting-room of the Royal Institute of British Architects, 9, Conduit-street, Mr. E. W. Mountford (President) in the chair.

Votes of thanks were passed to Mr. James Brookes for conducting the members over All Hallows Church, North St. Pancras, on the 2nd inst., and to Mr. Shaw and Mr. George Sherrin for conducting the members over the Brompton Oratory on the 9th inst.

The Chairman announced that Professor Kerr would begin his lectures on "Materials: Their Nature and Application," in Division III., on Tuesday, April 2.

Mr. J. W. Singer then read the following paper on "Iron and Brass":—

The two metals, iron and brass, are widely different in their qualities and characteristics. The former has been known from almost the early dawn of civilization, while our knowledge of the latter dates from comparatively recent times. Iron is one of the strongest metals, brass one of the weakest.

Iron is nearly everywhere in nature, aërolites being almost pure iron; even the stars showing it through the spectroscope; and it forms about one twelfth of the crust of our earth. Its particles are mingled in the dust of our roads; in the air we breathe; the water we drink; the food we eat; and is the great colourist of nature, giving the red colour to our blood.

In speaking of a metal, one naturally refers to its history, and when it may have been first used, but this can only be referred to prehistoric times. We know that iron succeeded the bronze period, some writers saying this metal was first used about a thousand years before Christ, others that it was known two thousand years before that era, there being much obscurity on this matter. Yet we read in Deuteronomy that the giant Og had an iron bedstead, and in the 9th chapter we read of iron hammers, the obscurity not being lessened

by writers saying that the Greeks knew nothing of steel. Although Homer speaks of iron as superior to bronze, and no doubt the bronze age and the iron age drifted into each other, and both were used together, the evidences of the iron age not being so well preserved as that of the bronze period, from articles made of iron so soon getting lost when in the ground.

Iron is mentioned very early in Jewish history. In the 27th chaper of Deuteronomy it is said—"thou shalt not lift up any iron tool upon them." Joshua speaks of iron chariots, and Job says that "the writings were graven with an iron pen." Whether iron was used in Solomon's temple we cannot say, but the hammers which were not to be heard there were of iron.

It is difficult to define when iron was first used in England, it having been questioned whether the Ancient Britons made use of it, but they worked in gold and silver, and Cæsar states that they had iron bracelets. Yet it is unknown whether the scythes which they attached to their chariot wheels were of bronze or iron.

For many centuries before Christ, and for fourteen centuries after, little progress was made in producing iron from the ore, the Hindoo, three thousand years ago, making iron and steel which cannot even now be surpassed, as they took the finest ore, free from phosphorus and silicates, and melted them with the best fuel, continuing this from four to eighteen hours, the soft composite mass being then rapidly separated from the cinder by hammering and reheating. A mild steel was produced by melting this bloom with charcoal, and thus was made the Wootz steel which Porus offered to Alexander as a precious tribute, and exactly the same process is carried out there to-day.

Iron is known in chemistry by the symbol "Fe," from the Latin word ferrum, and is nowhere in nature discovered pure. Bezzelius found that the metal made pure in the laboratory was almost as white as silver, soft and tenacious.

We in our land of plenty, as regards iron, have but little idea how this metal was valued by our ancestors, and even in the sixteenth century iron had a price that it is now difficult to realize, and which I am able to illustrate from the records of the parish church of my native town. In 1574, the effect of the Reformation brought about a great change as to the furniture of the church, a more simple rubric being demanded, and for that reason many things, such as copes, crosses, and candlesticks, were sold; the churchwardens having entered in their book of accounts of our church the results of that sale, and where there appears, amongst other items, the disposal of sundry bars of iron. After stating that a chest fetched 2s. 4d., an altar-cloth 2s., and a pair of candlesticks 2s. 10d., we see that they received for thirty-seven pounds of iron 3s. 1d., whereas, now such would not be worth selling, and the price cannot be realised, unless we consider the relative value of money then and now. The church-lands then let for 1s. an acre per year, and in the same book appears this entry in the year 1577:—"Paid for pointing the steeple and tower, and mending the ledd, and glazing the church windows 55s." Thus money was then at least twenty times its present value, and at this estimate iron was then worth quite 180*l.* per ton, or 1s. 8d. a pound, instead of its present price of about one penny.

I presume that every one here knows the first process of now making iron, it being simply to put the ore in a lofty furnace, with coal and limestone, so as to slowly melt the ore; the great effort being to see how little coal can be used for each pound of iron produced. Thus, in all rude attempts by a savage race, and even by the Romans to produce iron, they used eight pounds of charcoal for every pound of iron gained, which was a costly method. The next invention was the Catalan forge, which produced one pound for every 3½ pounds of charcoal. To this succeeded the Jersey or Champlain forge, when 2½ pounds of charcoal produced a pound of iron, this method being even now used in America and Spain, where wood can be easily procured. By all these processes the metal was not fully melted, but came out in a pasty form, which was at once hammered, and became good wrought-iron.

The result of cast-iron was brought about by increasing the height of the furnace to gain heating power, it being then found that the iron was melted, becoming highly carbonised, and pig-iron was produced, which was of little use until the way was found of decarbonising the pig, which was done by the puddling furnace.

When cast-iron was first used is a question not easily answered, as the Chinese antedated so many inventions, but we have no European work in cast-iron earlier than the close of the fifteenth century, as before that date the iron produced was like wrought-iron, and not the result of melting.

Thus the first application of iron for every purpose, whether for use or decoration, was undoubtedly in the form of wrought iron, such as produced by hammering, great perfection having been gained both by savage tribes for their weapons of war, and by the smiths of the eleventh and twelfth centuries, as may be seen in the well-known hinges on the doors of Notre Dame Cathedral. So excellent is this work that it has been seldom equalled, considered either in its massiveness in some parts, as compared to its delicacy of treatment in others.

South Staffordshire has always been the field where first-class iron has been long produced, but it has yet to yield the palm to South Yorkshire for iron of the very highest excellence, especially to the Lowmoor Company, who possess a vein of highly carbonaceous coal combined with rich ironstone, which enables them to produce iron of the finest quality, but the price has always placed it beyond general use, it being three times dearer than several other brands.

It was in South Staffordshire, on the river Stour, where the Dudley family commenced their career, an enterprising young man named Dud Dudley obtaining from King James I. a charter permitting him to use coal in the manufacture of iron instead of wood, one of the conditions being "that no smoke was to be emitted in the process," and thus he laid the foundation of that rich peerage, Queen Elizabeth having issued an order that the forest trees were not to be so much destroyed for ironworks.

Although Dud Dudley discovered the process of melting iron by means of coal made into coke by means of which there is no smoke, and thus surpassing his rivals both in quantity and quality, yet the secret died with him, and as late as 1740 the output of iron in Great Britain was only 17,420 tons.

Up to the early part of the last century all iron bars were produced by the slow process of hammering, at that time the slit rod trade being entirely in the hands of the Swedish and Russian makers, when a young man, named Foley, who was convinced of the fitness of the iron of his district, determined to find out the process abroad, and being a good musician, he dressed himself up as a peasant of the country, and, taking his violin, travelled the country as a wandering minstrel, getting access to many of the foreign works, and then returned, rejoicing that he had found the secret of slit rod-making, at once commencing work near Kniver; but repeated efforts only resulted in failure. Still, not discouraged, he started again on his old tour to find out where he was wrong, and discovered that all was right, excepting that he had omitted to put water on his rolls when working them; again returning to successfully start the great horse-shoe nail trade, which has employed thousands of people, until their work was replaced by machinery.

The Sussex foundries were so famous in the seventeenth century, because, like the Swedish makers, they only used wood as fuel, and as the wood became scarce, that was the cause of these foundries vanishing from the land.

It was from a foundry of that county that came the rails formerly round St. Paul's Cathedral, and some of them still remain round the statue of Queen Anne. This railing was cast in 1714, at Lamberhurst, and was removed in 1874. Part of it was purchased by Mr. Howard, an architect who went to Toronto to practise in that city; but the ship in which they were sent was wrecked, and they had to be fished up from the bottom of the sea. Mr. Howard purchased these rails to place round his wife's tomb, which had been erected in the park at Toronto, and he was anxious to have this particular ironwork, because, in his younger days, he and his wife did most of their courting when walking round this very railing. I may mention that another part of this same railing is now lying in a stable-yard of a gentleman's house near Frome.

As the modern system of very high furnaces only turns out cast-iron, called "pigs," and is very brittle, hence arose the puddling furnace to convert it into wrought-iron, which has been described as somewhat like churning cream for making butter, and by others to be similar to washing the dirt out of linen, except that fire and air take the place of soap and water as solvents to remove the sulphur, carbon, and phosphorus which may be in the cast-iron according to the fuel used—the sulphur coming from the coal, the phosphorus from the ore, and the carbon from both.

The primary stage of puddling is to melt the charge of white or mottled pig-iron, the molten metal being well stirred or "rabbled" to make it uniform, and to incorporate the "fettle"—fettling being the throwing-in of ground oxide of iron, which has been worked to the consistence of common mortar. The temperature is then raised until carbonic oxide is released, causing violent bubbles with a blue flame, the rabbling process being done with a long iron instrument protected with refractory cement, until the blue flame ceases. Bright grains of iron appear, the size of shot, which is termed "coming to nature"—*i.e.*, the nature of wrought-iron. Then the puddler reduces the heat and begins to ball the iron into lumps of from 60 to 70 lbs., which are then ready for the hammer or the rolls. This process gives the iron a kind of fibre, making it less likely to snap.

Another treatment of cast-iron is to make what is known as malleable iron, first used at the beginning of this century, and is essentially cast-iron made flexible by the process it goes through of annealing. The best Cumberland ore is required, and when the castings are first made they are hard and brittle. These are placed in pots, surrounded by ore of the same kind as the castings were made from, and are then subjected to heat for about a week, a conversion then taking place, like the formation of steel, the pot taking about three days to get to a white heat, which is kept up for twenty-four hours, and then for another twenty-four hours is allowed to die out, the castings being then ready for use.

My paper being upon iron, it is not necessary to treat of steel, but it may be mentioned that iron and steel differ chiefly in the carbon which is mingled with the pure iron molecules—wrought iron containing little carbon, steel some, cast iron more. This is most of the story, but, of course, not all. Thus, steel can be produced by taking carbon from cast-iron, or by adding carbon to wrought-iron.

Wrought-iron is almost the only metal that can be welded together, which means that when brought to nearly a melting-point, which is known by the sparks coming from the fire, and after some silver sand has been thrown in the fire to prevent oxidation from the air coming to it, by great quickness of action the two parts are brought together, and by smart hammering they become united in one solid piece. For this process three things are necessary—good iron, good clean coal, and a skilful and quick workman. For fine work our anvils are put quite close to the forge, as small fine work cools even in the transit of a few inches.

It is this quality which gives to wrought iron its great charm as a metal for ornamental work, a charm that is all its own, and enables the smith to produce work which can be carried out in no other metal. No metal so repays a skilful workman as wrought iron, and in no other material is, I think, the distinction so evident as the stamp left upon it of good or bad treatment. The smith must model his forms while the iron is hot, and no amount of after cutting and filing will produce that free and artistic feeling with which a good workman impresses his work.

How wide a subject is that of iron may be understood in mentioning that in Great Britain alone, there are 16,000 places where the same is dealt with in some form or another, and 7,000 persons as principals are engaged in carrying out industries closely connected with it. Even the various forms of iron are each a study not easily mastered, there being so many varieties of this metal, each of which is again sub-divided into many brands, even the furnaces for the raw material producing many different sorts, some turning out Hematite, others the kind called "Mine," or "Part Mine," also cinder or Ferro-Manganese; and in steel works there are the different sorts of Bessemer, the open hearth, and the crucible. There are also thirty-four distinct allied trades connected only with the manipulation of iron, not including the production of the raw material, from anchor-making to wire, chain, and rope making, nail works, &c.

There are many varieties in even the sub-division of wrought-iron, the merchant from whom we purchase this metal, having on his list eight sorts of wrought and fourteen kinds of steel, the wrought-iron varying from 6*l.* 10s., up to 22*l.* a ton, the steel running from 12*l.* to 68*l.* a ton. Each of these would have a different brand or mark, each of the varieties being the production of a special firm.

To ensure good iron being used, it would be well for every architect to know the hieroglyphics on it, as the appearance of bars at 6*l.* 10s. a ton

is much the same as that costing three times the amount. Thus the cheapest iron is Welsh, having A and a crown impressed on the bars; the next is that having N H & S with a crown—this being Staffordshire—costing 7*l.* 5s. a ton.; the next quality has Netherton Best, with a crown between the words; after this, comes the old brand of B. B. H., this is 8*l.* 10s. a ton. S. C. with a crown is very fine iron at 10*l.* 10s. a ton; charcoal iron has the letter L in a circle, this being 17*l.* a ton, and is used for cylinders, boiler-plates, and engine iron, where great tenacity is required.

England has long been famous as the centre of the iron industry of the world; but I fear there is a warning that we have passed the zenith of our prosperity, for Germany and Belgium are fast treading on our heels, the President of the Iron and Steel Institute, in his late address, giving a warning when speaking on this subject, saying that from 1873 to 1875 our exports had fallen from thirty-seven to twenty-five millions worth of iron, that is twelve millions less in only two years, and at even that low state they were five millions above the exports of 1893, which deplorable state of things arose from the increased price of coal, and the lamentable strikes throughout the land, although the wages paid to our men were fifty per cent. above foreign workmen. With such competition how can England compete with the world in this industry, and her greatness in the iron trade, is, I am afraid, a thing of the past, unless a change comes over the mind of the British workman.

Having spoken on the history and manufacture of iron, I fear to exhaust your patience to say more on it, than to make a few remarks on its application to architecture. The subject of the value of iron for constructional purposes is beyond the scope of my paper. In this capacity it forms part of the anatomy of architecture, with which you are only too well acquainted.

Nor shall I refer to the modern application of the metal, such as in railway stations, the Crystal Palace, &c., where the construction is fully exposed to view. These, though triumphs of engineering skill, have only such beauty as attaches to a skeleton.

I cannot speak with enthusiasm of the examples where it has been used by itself and for itself, such as the well of Quenten Matsys, all such having a tendency in my opinion to look meagre and poverty-stricken.

It is where it plays a more unassuming but useful *rôle* as an accessory or adjunct to a building that it finds its best expression. Within this limitation, quite enough field is left to tax all the energies of the metal-worker. Its strength, durability (if properly treated), and the way that it lends itself to every method of manipulation are the qualities that specially commend iron for application in connexion with architecture, for screens, grilles, gates, lighting purposes, door fittings, &c.

Very numerous are the other uses for ironwork in a building, and quite equal in number are the possibilities in the way of decoration, and I think it will be admitted that when treated by a master hand, the metal never looks obtrusive or vulgar, but that it gives additional value and interest to the whole work.

In door-fittings, for example, what force and vitality there are in some of the old hinges, from the almost plain strap, with its few vigorous marks, to the forged and chiselled masterpieces of the twelfth, thirteenth, and fourteenth centuries. Possibly our modern smiths will never excel them.

I venture to hope, however, that in another branch, namely, screens, we may yet make some advance. The old smiths laboured under some disadvantages in this respect compared with ourselves. They had no machinery as we have for producing bars of all shapes and sizes, or sheets of every thickness and dimension. Thus for large screens they had to fall back upon wood and stone.

I do not wish to decry either material for this purpose, but I think there are often occasions when a screening off is necessary without obstruction of light or division of the perspective of the building. Then I venture to say that iron is essentially the material for the purpose.

Screens may be made to exhaust all the resources of the metal-worker—forging, chiselling, piercing, repoussé work, enamel and addition of various metals, mouldings of all sections, and tracery, scrolls, and leaf-work of every kind. I need not mention that several eminent architects have drawn attention to this interesting subject, and I little doubt that it will receive still more in the future.

Iron has found its last and not least appropriate application in connexion with the electric light. I fancy the artists of the Middle Ages and the Renaissance would have fairly revelled in the various treatments suggested by this triumph of science.

The delicate treatment that this mode of lighting seems to demand from its very nature, needing no tubes and very little support, is just the scope that calls for the playful display of fine wrought-iron work. I often think we are too serious in our ornament, and give it too laboured an effect, as if it had been designed and wrought after most painful and serious consideration.

There are several features that should make us hopeful of the future of iron-work in this country—namely, the attention now given it by architects, also the help now rendered it by science, so that good iron and steel can always be obtained with care in selection. I think I am also justified in saying that many of our smiths have attained a wonderful amount of skill. No doubt what we most lack is the taste, or instinct, for what is within the power of the material. Also probably we are only gradually learning how much of the work should be done within the glare of the smith's fire, and how careful one has to be not to take the life out of the work afterwards.

One great evil we have to contend against is the hurry and drive of the present day, which does not always leave the worker time to work with all the loving elaboration as of old. But when all is said that can be against the present condition of things, I still think that we ought to be in a condition to produce iron-work in harmony with the best architectural products of the epoch.

I must now say a few words upon the subject of brass. From an artistic point of view this metal does not hold so high a position as bronze, as it is inferior to the latter in many important qualities. Its colour is not so good, its contraction in casting is greater, and in a molten state it does not run so freely into the mould; also it is not so satisfactory a metal for the chaser to manipulate. Still, it is the better known and more-used metal of the two, one reason being doubtless that it is cheaper, unfortunately a most important consideration in these days. Bronze is the metal in which the sculptor usually produces his work in metallic form; brass, on the other hand, being the metal we see around us in the numerous objects of everyday use.

Brass is a compound alloy of the two metals copper and zinc, bronze being an alloy of copper and tin; and it is difficult in any historical account of these metals to distinguish clearly which is intended in any earlier mention of brass than 1721, when zinc was discovered, or rather produced by Henekel, as a commercial metal. But the word brass has been used far longer than this idea of the metal as is now understood by that term, and the name for it has been supposed to come from the Spanish word "brasas," meaning the colour of flame, our word "brazen," with its many meanings, no doubt being derived from the glaring appearance of the polished metal.

This metal differs greatly in its history from iron, as casting in the latter has been the last development of its use and application, whereas with brass and bronze that was the first form as to the employment of these alloys, and all the earliest finds are the result of casting as the most ready application for their use, and the pre-historic nations made beautiful castings in bronze, whereas iron was known for over three thousand years before Europeans could succeed in casting it in a fluid state.

We read in Hebrew history of "Mountains of brass," "Dig brass from the hills," "Brass molten from stone," but as this metal is never found in nature, no doubt copper is the metal intended. Yet it is singular that the word copper is only mentioned once in the Old Testament.

It may have been bright copper or bronze of which the brazen serpent was made for Moses, and so also when we read of "Brass as precious as gold" for the vessels which Ezra caused to be made for the Temple; but this much is certain, that all the metal work which Layard found at Nineveh was made in bronze and not brass. So, no doubt, was the famous Colossus at Rhodes, 105 ft. high, taking twelve years to make, costing 300 talents, equal to about 118,000*l.* of our money. The progress in modern manufacture may perhaps be in some way indicated when I mention that our firm has been allowed less than the same number of months to reproduce a monument in bronze about half the size of the Colossus, and I regret to say that for this work we receive only about one-hundredth part of the sum that was paid for the Rhodian giant.

Doubtless all the metal-work of which such details are given for Solomon's Temple, as to the "gates and pillars of brass," were really bronze, and has been wrongly translated. It may be noted that bronze is just the metal which even savage tribes would soon learn to produce, as in such places as Cornwall, where copper and tin are both found in the native state, the first time they became fused together bronze would be the result.

It is supposed that the Greeks and Romans knew nothing whatever of the ores of zinc, which are quite infusible alone, and it was not until 1270 that they were mentioned by any European writer. After that date they were reduced to a malleable state by putting 40 parts of copper with 60 parts of carbonate of zinc, when 60 parts of brass were the result. Even up to 1805 zinc was regarded as a semi-metallic substance, and only since that date has assumed the importance of a large industry for many purposes.

That it may be seen how difficult it was to produce large pieces of so-called brass, I may mention that up to the fifteenth century it was found impossible to make a piece of metal which could be hammered out as sheet brass beyond about 2 ft. square, whereas now it can be had 20 ft. long, but even at this late date the metal was more bronze than brass from its having tin in its composition. This will be seen from the colour of the piece of metal I can show you, and which I have had polished so that its red colour may be seen.

It may here be noted that a little confusion has been caused by some workers of the present day, terming the metal in which they engrave memorial tablets "latten brass." This, of course, is a misnomer, as it is merely a repetition of the same word in two languages, as the old French word for brass was "laiton."

The metal was so costly that in the sixteenth century they often destroyed earlier memorial brasses by turning them round and cutting the new designs on the back of the older ones. I have the pleasure of showing a few rubbings of brasses which I made in Belgium, which indicate very clearly the sizes of the sheets which could then be obtained. Also some of these rubbings, you will see, are the backs of brasses which have newer designs engraved upon the other side of them.

Brass-work, strictly so called, was not attempted in England before the time of Henry VII., and the railing round his tomb in Westminster Abbey was soon after made, the trade getting general in the time of Elizabeth, who encouraged workmen from the Low Countries to come to England. Yet in 1649 some large works established at Esher, in Surrey, proved a failure, ending in ruin to the founder. The next attempt was in 1678, when the Prince Rupert Mills were started. Then came some works at Hackney, called the Temple Water Mill Works, water being used to drive the hammer, this being before rolls were invented. After this came the Baptist Mills, at Bristol.

Up to this time brass was only produced by using calomine, and melting copper with it, but in 1721 pure zinc was produced, and great changes took place soon after in the manufacture of brass.

As already stated, this metal is a mixture of copper and zinc, and these are run together in a state of fusion, in various proportions, to form the many kinds of brass that are needed—copper being the chief part of the alloy. The Japanese are said to have 200 varieties of these alloys, according to the colour they desire in the finished metal.

The zinc group gives:—5 parts copper to 1 of zinc to obtain rich sheet brass; 4 parts copper to 1 of zinc for Pinchbeck brass; 3 parts copper to 1 of zinc for Dutch metal; 2 parts copper to 1 of zinc for ordinary yellow brass; 1·75 parts copper to 1 of zinc for pale brass; 1·25 parts copper to 1 of zinc for dipping brass; 1 part copper to 1 of zinc for hard solder, it being understood that the more zinc is used for the alloy, the cheaper is the metal produced, and the less durable it becomes.

Although my remarks are upon brass, it may be well to give the alloy of copper with tin, *i.e.*, bronze, as these metals are so closely allied.

20 parts copper with 1 of tin gives a rich red metal; 10 parts copper with 1 of tin gives the best form of bronze; 4 parts copper with 1 of tin gives bell-bronze, which is brittle, and unfit for any other use.

The best metal for taps, cocks, &c., is composed of 4 parts copper, 1 lead, 1 zinc, and ½ of tin.

Up to a late period of the last century the manufacture of brass was a slow and tedious pro-

cess, taking at least twenty-four hours, as they used the carbonate of zinc, or calamine, with the copper, in taking that time to reduce the ore, and unite it with the copper; but now that the metal zinc can be obtained in a pure state, the process can be completed in about an hour, for as soon as the copper is melted, the zinc is then added, either in a molten state, or is plunged down to the bottom of the molten copper, and then well stirred, or in the casting, the zinc being the lighter metal, will be found too much in the upper part of the casting.

Any of the above alloys can be easily cast, but no ornamental work, or any object, excepting plain block ingot, can be cast in copper alone, the contraction of this metal in its pure form being so great that, when cooling from the molten state, it pulls itself to pieces when anything prevents that contraction. The difficulty attending contraction will be seen when I mention that the base of the statue of Lord Napier contracted just over one inch, and if provision had not been made for this, this mass of metal, weighing nearly half-a-ton, would have pulled itself to pieces in cooling.

The Chinese have a clever method of reducing the effects of contraction as much as possible, by making the flask in which the casting takes place to contract in an equal degree with the molten metal, thus keeping the mould close to the metal, and by this means getting a sharper result.

Brass is very tenacious, but it has this defect, that if the tension is continued, a singular molecule change takes place, rendering it rotten and most unfitted to support any heavy weight.

This fact was evidently known to the brass workers of the sixteenth and seventeenth century, for it will be noticed that they never used brass to suspend the large brass chandeliers made about that date, and so often seen in our churches, but invariably used iron rods. It has been said by an authority that every brass pendant hung by means of brass supports will drop within fifty years. This may be an exaggeration, but brass is not a suitable material for the support of any heavy object.

Brass is the metal in which a very large proportion of what is known as objects of applied art are now produced, bronze being retained for fine art. And to bring it into suitable shapes, brass is cast, drawn into round wire, flat strips, hollow tubes, and rolled into sheets, and in these various forms easily lends itself to the manipulation of the workman.

There is now no time to more than just refer to the long series of operations through which this metal passes in its many different modes of treatment. Thus in a molten state it is cast into suitable forms moulded in sand. The model from which the mould is made may be either carved in wood or modelled in clay. The castings, according to their shape and the object for which they required, are either turned in a lathe, or are chased. Brass is also beaten into forms or embossed, bent into scrolls of various kinds, when in the shape of strip brass, and also there is the large subdivision of engraved work.

Mention should also be made of the process known as spinning. The form of the object that is to be spun is first made in either hard wood, or if a great number of the article is required, it is made in metal. This form, which is termed a chuck, is put in a lathe, and against it is fixed a brass disc. The lathe is then put into rapid motion, and various steel tools of different shapes pressed with considerable force against the disc, beginning in the centre, and gradually working outwards as the metal yields to the pressure, and takes the form of the model. It is a very interesting process, and astonishing how quickly a good workman can spin a number of forms, which, if they had to be hammered up, would entail much time and labour.

Brass is also used for repoussé work, and this process is, perhaps, the one that requires the most highly skilled and artistic treatment of any through which the metal passes. It is not quite such a suitable metal for this purpose as copper, as it is not so soft, and cannot be stretched so easily without cracking, but this method of execution has been, and is still, very generally employed for converting this metal into ornamental forms—the processional crosses on the table being interesting examples of the application of repoussé work.

After brass has been treated in one or other of these processes, it is either polished or dipped in an acid solution and burnished, to give the metal its bright yellow colour, with which we are so well accustomed,

As brass cannot be welded like ron, another mode of attaching the various parts of a piece of work has to be adopted, and, as may be imagined from the general use of this metal for the manufacture of ornamental forms, this process, which is known as soldering, is not a difficult one. The two surfaces are united by the application of sufficient heat to melt a more fusible and baser metal which is introduced between them, and which combines with both, and firmly unites the two parts.

It will thus be seen that many industries throughout the country are the result of the many processes through which this metal passes, before it comes before us in the form of, say, a lectern, or an altar-cross for our church, a gas-bracket, or an electrolier to light our room, a door-handle, or a fender; and, perhaps, no metal has a more universal application, as it is used for almost every form of ornament needed in metal for either ecclesiastical or domestic purposes.

As brass is a metal that easily tarnishes, it has been found necessary to coat it with a thin substance to preserve it from the effect of the atmosphere. This is termed lacquer, and is a thin, transparent varnish put on the metal when hot. If the object could be kept from moisture being deposited upon it, and be occasionally wiped over, there would be no need of its being lacquered, but as this does not seem possible the work is usually lacquered, and not always with satisfactory results, for you must often have noticed the dark streaks upon memorial brasses, the reason being that generally such work is in a church, of which the heat is only raised on the Sunday. The air then gets warm much sooner than the brass, which is on a cold wall, the wall taking a long time to get its temperature raised, and during this time the moisture is deposited on the brass. This cannot be absorbed, as on the surface of the walls, and the moisture runs down the brass, producing streaks on the metal, and are caused by the lacquer being destroyed by the damp. The better plan, I think, is not to lacquer a memorial brass, for it should not be difficult to find willing hands, who about once a month will give such work a few minutes' attention, and this would be sufficient to keep the metal a good colour.

It is a question if it would not be desirable to make a larger use of bronze in preference to brass. I confess that for many purposes I consider the former the best metal. Thus, for work in churches, I think bronze the better material of the two. It is more durable, of a richer shade, and it retains its colour much better, as brass so easily tarnishes, on account of the zinc in its composition, and the difference between the cost of the two metals is really little; in fact, our firm is always willing to supply bronze at nearly the same price as may be quoted for brass. I believe in the future bronze will be much more generally used than it has been in the past.

The application of brass to architecture is not quite so direct as in the case of iron; as brass, being cleaner to handle, and no doubt also because of its colour, and the facility of its manufacture, is more often used for movable pieces of furniture, such as lecterns, candlesticks, crosses, vases, and numerous articles in daily use.

It is now recognised, however, that even a piece of furniture has its influence upon a building, and deserves and repays the architect's attention. It is admitted, at the present day, however it may have been a few years ago, that it is hardly expedient to turn the architect out of the house as soon as the four walls are built.

Moreover, almost every fixture applicable for iron has also been made in brass, with more or less success, the adoption of the latter giving a more luxurious effect than the harder and less costly metal. We all know the rich appearance of the fine old coronæ, with their little turrets and rich bands of ornament, which date back to very early times.

Triumphs of art were the old brass shrines on which devout Christians lavished their best efforts, and although so elaborate, they do not give the idea of laborious execution, but almost spontaneous growth. Abroad I notice that brass altars have often been produced in recent times; they are very rich in workmanship, and may perhaps with advantage be adopted in this country.

I think in the later French styles, the glitter of the brass pendants and brackets greatly contribute to the very finished and furnished aspect of the period.

England is perhaps not so rich as some countries in examples of old brass work, but there is a certain dignity of style about such as we have—for instance, the old brasses and lecterns, which have been revived with some success.

I must now bring this imperfect sketch to a conclusion with the earnest hope that the crafts connected with iron and brass may be developed and flourish to the advantage of architecture.

I need scarcely add that their future success depends largely upon the profession represented by the gentlemen I have had the honour of addressing this evening.

The Chairman, in inviting discussion, said the members were very much indebted to Mr. Singer for coming all the way from Frome to read his paper. Mr. Singer, he was afraid, had gone into parts of the subject into which they were hardly likely to be able to follow him, but there were a good many points in connexion with iron and brass on which discussion might arise.

Mr. Matt. Garbutt proposed a vote of thanks to Mr. Singer for his very interesting paper. The subject was a large one. It had always been a puzzle to him to know how the Orientals had produced the enormous forgings of iron, of which the famous lât at Delhi was an example, at a period when heavy machinery was, so far as we can discover, unknown. Mr. Singer had truly said that it was a pity bronze was not more frequently used in place of brass. Bronze could now be obtained of a colour and texture scarcely distinguishable from brass, costing very little more than brass, and which would keep its colour far better than the inferior material. The Japanese excelled in producing artificial patinas on the surface of bronze, obtaining by this means a very wide range of colour. This seemed a most appropriate method of surface treatment for metal, and might be applied to many small decorative features in connexion with architecture, such as hinges, door fittings, &c., as these patinas required no protecting lacquer, stood handling well, and retained their beauty for an indefinite time. Brass, he believed, could be treated in a similar way. He would like to know if Mr. Singer was aware of the process by which the Japanese obtained the colour of iron, and fixed it, so that it remained as a rust upon patina, and not as a mere loose accumulation of oxide?

Mr. Singer replied that the process was unknown in this country.

Mr. J. C. Stockdale seconded the vote of thanks. The paper should be of some assistance to them in designing, because if they remembered that brass had to be lacquered to retain its colour, it would deter them from using it in many ways. For instance, if they used brass, they must bear in mind that if they did not wish to have it lacquered, it must be of a sufficiently smooth design to allow of its being kept polished by hand. Then, again, if bronze was to be used instead of brass, the question was whether they could use it for repoussée work, or if it would be too brittle. The lecturer, in tracing the history of brass, had not referred to the cymbals so often mentioned in the Old Testament—whether they were made of brass or of some other metal? There were certain things which should be kept in mind in designing wrought-ironwork, and particularly in deciding the sections. It was easy to get a good effect on paper, but the result was often very different when the work was carried out. A square section should be used with great caution in scroll-work, for though, on paper, a light effect might be obtained, it should be remembered that a square had four sides, and when seen diagonally the result was very much heavier. A circular section in scroll-work could be used with greater safety than a square section, for the reason that the size was always the same, whichever way it was looked at.

Mr. H. A. Satchell thought that much might be done with the use of bronze in tablets as decorative features, such as the friezes of buildings, especially if it were possible to obtain a legible lettering in the bronze with the name of the building or the parties for whom it was built. He had recently used a bronze panel, with the letters merely polished, but these had quickly taken a beautiful half-tint, and, though artistically pleasing, were not at all satisfactory to the owners of the building, as they were illegible at a short distance. He would therefore like to ask Mr. Singer if he could suggest any method of treating bronze in two colours otherwise than by gilding, to enable one part of the pattern to be defined? He would also like to know what was the practical difficulty of lacquering brass work so as to do away with the necessity of frequent cleaning, especially in the case of domestic articles, such as candlesticks, fireplaces, and grates? Was there any way of ensuring that the lacquer used would stand? Also, why did the old wrought-iron used for scrolls, &c., last so much better than the modern work? The old wrought-iron scrolls were still in a good state of preservation, whereas

a good deal of the new work looked shabby after being fixed for six months. Was there no way of using something which would keep the surface of the ironwork free from rust?

The Chairman said he had always been rather puzzled as to where Moses obtained the brass with which to make the brazen serpent, as it must have been rather scarce there. Mr. Singer had referred to the Sussex foundries, and their having fallen into disuse, owing to the failure of the supply of charcoal. There seemed to be some chance of these foundries being re-started, if the coal now being looked for in Sussex turned out to be of any use. He did not know, however, if that was a thing to be desired, because at the present time Sussex was a beautiful county, and it was too dreadful to think of it being turned into another Sheffield. As to screens of iron or brass, he had never seen one in a church which was satisfactory as a screen. Speaking of electroliers, Mr. Singer had said that he could fancy how the artists of the Middle Ages would have revelled in the treatment of these. From his (the speaker's) experience of electroliers, he could say that the wires in them were a greater nuisance than gas-pipes. An electrolier with six or eight lights had the same number of wires, and these caused more trouble than the old gas-pipes did. Most people seemed to look upon lacquer on brass as they did upon electro-plating, and were unable to understand that if the lacquer came off, the brass would be as good as before, and possibly a trifle better. The only objection he could see to lacquer was that it made the brass-work unpleasantly smooth, and took the "go" out of it.

The vote of thanks, on being put to the meeting, was very heartily received.

Mr. Singer, in replying, said that the fact of being able to make an iron screen so light, and yet answering all the purposes of a screen or guard, from the strength of the material, seemed to be a strong argument in its favour. The light was not obstructed, nor did it interfere with the architecture in any way, whereas a wooden or stone screen shut out nearly everything. With regard to the question of lacquer, it was simply a thin transparent varnish applied to the surface of the metal while hot, and as long as this varnish remained, the metal kept its colour, but directly the lacquer wore off the metal needed cleaning to keep it bright. In a damp place the lacquer disappeared much sooner than in a dry building. It should be understood that lacquer did not improve the work in any way, and the better the process was carried out the more invisible it was, but bad lacquering greatly marred the effect of the finish. As to the colour of bronze when exposed to the open air, he knew of no substance with which it could be coated to prevent oxidisation. Bronze became a very beautiful colour, and he could refer to a statue in Bristol of William III. which had a very fine natural patina upon it. It was the smoke and dirt of London which caused our statues to turn so dark a colour. He wondered this metal was not more largely used for architectural work, as when an ornament was frequently repeated a model could be made, and be repeated in bronze at a less cost than if carved in most materials. Regarding repoussée work, bronze was quite as suitable a metal for its execution as brass, but copper was better than either, the latter being a softer metal, which could be more readily worked, and could be raised to a higher relief without cracking. In reply to the question as to the durability of modern wrought-iron work compared to old work in that metal, Mr. Singer referred to the part of his paper dealing with the different qualities of iron.

The proceedings then terminated.

ARCHITECTURAL ASSOCIATION: DISCUSSION SECTION.—The ninth meeting of this Section was held at 56, Great Marlborough-street, on the 20th inst., at 7 p.m. The Chairman, Mr. W. Henry White, presided. A paper on recent building legislation entitled "The Difficulties of Building in London," was read by Mr. J. Douglas Scott, A.R.I.B.A. The discussion which followed the reading of the paper was opened by Mr. Tyars, and was continued by Messrs. Brodie, Beale, Murray, Stockdale, Tayler, Weymouth, Haggard, Jones, and the Chairman.

WAVERLEY STATION HOTEL COMPETITION.

DR. ROWAND ANDERSON, who was one of six invited competitors for the new hotel and offices for Waverley Station, Edinburgh, has addressed to the Railway Company the following letter, which sufficiently explains itself:—

"16, Rutland-square, Edinburgh,
February 23, 1895.

DEAR SIR,—I duly received your letter of the 19th, written in reply to mine of the 16th inst., and I have to express my regret that you have not replied to the question put in my letter.

In your letter of the 14th you stated that the designs for the proposed new hotel and offices at Waverley Station had that day been carefully considered by the directors, and you intimated their decision on the plans submitted. On the 16th I wrote you asking if the directors had the plans, sections, reports, and estimates examined by experts before coming to a decision; and, in reply, you have referred me to the conditions set forth in your letter of October 26 last, under which various architects were invited to submit plans. It is needless to say that I had referred very carefully to that letter, which contained minute and particular directions requiring to be observed by the competitors as to the methods of arranging and placing the building, the height of the building at various points, provisions for communication between different sections of the building, and other very important matters affecting the designs. The letter of instructions stated that the directors should be the sole judges of the designs, but did not suggest that the directors were not to adopt the only possible methods of forming a judgment.

The circumstances connected with the competition and the decision of the directors have been so extraordinary that I think an explanation is due alike to the competitors, the architectural profession, and the public; and it was in the hope that some explanation would be offered that I addressed you on the 16th.

When architects enter into a competition, they know that only one competitor can be successful, and I should never cavil at the result where the designs submitted receive adequate consideration, and an honest attempt is made to do justice to the competitors. In the present case it is evident that these conditions have not been observed, and the competitors have the gravest cause of complaint against your directors. Apart from the competitor whose designs have been accepted, five architects of established reputation were invited to compete, and I am justified in saying that they all devoted much thought, labour, and expense to the preparation of their plans. I devoted to the work my own time and the time of twelve assistants, working extra hours for eight weeks, to the exclusion of other work, and I have no doubt the other competitors must have made equal sacrifices. It was freely stated to myself and others that we might save ourselves the trouble of competing, as the result was a foregone conclusion; but I declined to believe that the directors of the North British Railway Company would ask professional men to give their time, skill, and experience to the preparation of plans, without the intention of dealing fairly with them in the award. It is now abundantly evident that the designs have not been carefully considered.

My plans were sent in only on the night of the 11th, and the decision was intimated on the 14th, on which day the designs were, as stated in your letter of that date, "carefully considered by the directors."

The directors had to examine and compare the elevations and plans of six sets of designs for a block of buildings to consist of a large hotel, railway offices, and shops, requiring to be adapted to an exceptional site, and it was part of their duty to the competitors to take proper means of satisfying themselves that the different designs were in conformity with the instructions issued, and that the actual conditions as to available space, height, and other important details were observed. In dealing with designs for a work of such magnitude, involving the consideration of the grouping and arrangement of hundreds of apartments, the directors ought, in ordinary course, to have had expert assistance and advice alike as to the more purely architectural quality of the designs and their practical adaptability to the purposes to which the buildings are intended to be put. The schemes of arrangement of the interiors alone (without speaking of the elevations) had taken weeks of thought and planning on the part of each competitor, and it was a matter of absolute physical impossibility for any one, even an expert, to master the details of the several schemes within the time that elapsed between the sending in of plans and the award.

By whatever process the decision of the directors was arrived at, it certainly was not reached by the only proper course of considering each set of plans in detail and comparing them with each other. Even if the directors were, unaided, competent to make such examination and comparison, it is quite evident that they did not attempt to do so.

As a practical man, acquainted with the difficulties of the task, I have no hesitation in saying that the directors, when they gave their decision, were necessarily ignorant of what they were dealing with beyond such vague ideas as they may have been able to form from a pictorial representation of the buildings, and I say that it is disgraceful to treat in such a way men who have attained a position in an honourable profession. The directors could have entrusted the work of designing the building to any person they pleased without going through the solemn farce of inviting competitive designs. Having invited competition, they ought surely to have allowed a decent and sufficient interval for the adequate consideration of the designs to elapse before announcing their decision, instead of adding the insult of a public slight to the injury inflicted on the competitors, whose labour, thought, and outlay have been wasted.

The annals of architectural competition have many chapters of injustice, but I have never known of a competition conducted with such a contemptuous disregard of even the ordinary forms of fairness. I am quite aware that I lay myself open to cheap sneers about the disappointment of unsuccessful competitors, but I am satisfied that a piece of gross and wanton injustice has been perpetrated; and I shall not allow any fear of misrepresentation to deter me from offering my strong and earnest protest against what I consider injustice and insult to the architectural profession.

I request that you will submit this letter to your directors, and I remain, yours faithfully,

(Signed) R. ROWAND ANDERSON.

The Secretary, North British Railway Company.'

THE ARCHITECTURAL ASSOCIATION SPRING VISITS:

CHELSEA POLYTECHNIC, TOWN HALL, AND FREE LIBRARY.

THE fifth spring visit to works in progress was paid on Saturday last to the Chelsea Polytechnic now in course of erection in the Manresa-road, Chelsea.

The visit was prefaced by an inspection of the Chelsea Town Hall* and Free Library,† at the former of which Mr. Brydon, the architect of all three buildings, kindly met the party. The general arrangement of the Town Hall is well known to our readers, and is a good example of straightforward planning. The hall itself is surrounded on all sides by a wide corridor, rendering it convenient of access; it is 80 ft. long by 50 ft. wide and some 40 ft. high.

The overdoors and panelling in walnut were much admired by the members. The carving is executed by Mr. Aumonier, who is also responsible for the sculptured work throughout the building. The Devonshire marble columns are also excellent examples of their class. Mr. Brydon took the members to the yards at the back of the building which abuts on some low-class property, but which presents a charming elevation in Mr. Brydon's best manner, and which, in the course of a few years, will be visible to the public, as a street is planned to pass through the property.

A visit to the library in Manresa-road followed, where the members had the additional advantage of being shown over by Mr. Quinn, the courteous librarian, who gave some very valuable hints as to the economical distribution and working of a public library. The elevation is in Monk's Park stone and Lawrence's bricks. A visit was next paid to the adjoining Polytechnic, lately won in competition, illustrations of which will be found in our issue for March 21, 1891. The building is practically a finished carcase as far as the present contract is concerned. The present building forms three sides of a quadrangle surrounding a central open space eventually to be occupied by an entertainment hall, bath, and gymnasium. The portion erected consists of basement, ground and first floor, the school of art being placed on the second floor centrally over the front. The basement contains the bricklayers', carpenters', plumbers', and engineering workshops. The ground floor is given up to the social side of the scheme, and consists of refreshment and reading rooms: the entertainment hall will eventually be on this floor.

The first floor contains the class-rooms and lecture-rooms in connexion with the educational facilities which the Polytechnic will provide for.

Some interesting particulars were given by Mr. Brydon as to the general working and arrangement of the whole scheme, which will form when finished one of the most complete establishments of its kind in London. The front is in Portland stone from the Whitbed, and Lawrence bricks are used for the walling.

The three buildings visited form an interesting collection of the architect's work during the last ten years, and are a notable group of contemporary architecture. The members, who numbered about 120, thoroughly appreciated Mr. Brydon's courtesy and his explanation of matters of detail, and, on the motion of Mr. Banister F. Fletcher, accorded him a very hearty vote of thanks.

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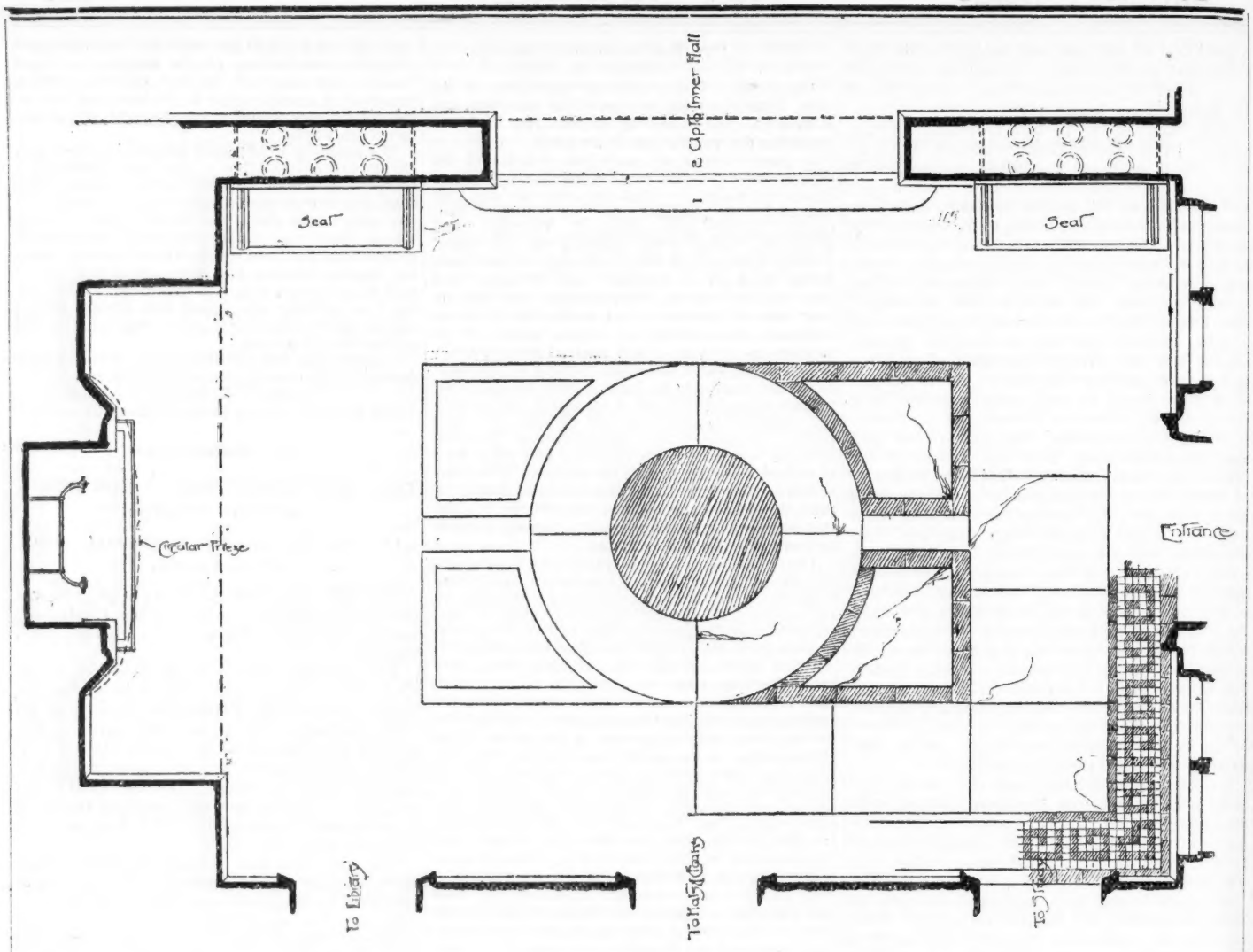
* See the *Builder* for May 2, 1885.

† See the *Builder* for June 8, 1889, and January 24, 1891.



Plan shewing Pavement

Design for an Entrance Hall.

DRAWINGS FOR THE ROYAL ACADEMY.

EVERY year we call the attention of architects who send up drawings to our care, to the requirements of the Royal Academy, but every year we receive drawings sent up without the proper labels, for want of a little ordinary attention, which ought to be given. We will put it down once more. The Academy requires:—

1. A label hung to the frame by a cord, containing the title and author's name and address.
2. A similar label pasted on the back of the rame.
3. A letter to the Secretary of the Royal Academy containing the same information.

If there is more than one drawing, each must be numbered, and the titles in the letter to the Secretary given under their respective numbers.

Only gilt frames are admissible.

We hope those who send us drawings will be good enough to pay attention to these requirements, thereby saving us much trouble which might easily be avoided.

Illustrations.

ARUNDEL CHURCH DECORATION.

IT may be remembered that the restoration of the nave roof of this fine old church was lately carried out under the directions of Mr. Geo. H. Fellowes Prynne, F.R.I.B.A., a notice of which appeared in our columns at the time. When the restoration was being carried out, it was proposed to decorate the wall space above the tower arch, which separates the portion of the building that is used as the parish church from the original sanctuary, now used as a private chapel by the Duke of Norfolk.

Our illustration is from a sketch design made for this purpose by Mr. Edward A. Fellowes Prynne, brother of the architect.

The scheme for the decoration represents Christ in Glory, surrounded by apostles and typical saints, with adoring angels and symbols from the Revelations.

Beneath the lower arch, on the wall blocking out the real sanctuary of the church, is represented the humiliation and death of Our Lord in his Crucifixion, with St. John and the Virgin standing by, this scene being in dramatic contrast to that of the Glory above.

In the spandrels over the top arch are the Symbols, from the Revelations, of the four Evangelists.

TEST COURT, CHILBOLTON.

THESE buildings, which are all but one labourers' cottages, were designed somewhat in the form of an almshouse to suit a particular site. They consist of one superior and ten four-roomed cottages. The cottages are planned upon the principle that three bedrooms can be secured with separate entrances and all with fireplaces. Thus if the occupants have children, the sexes can be separated, and if not, one room can be let to a lodger without inconvenience.

A model cottager's laundry is attached, but does not appear upon the plan.

The architect is Mr. W. D. Caröe, and the drawing was exhibited at the last Royal Academy Exhibition.

WROUGHT-IRON SCREEN, BURGOS CATHEDRAL.

IRONWORK is, perhaps, the most artistic development in Spain, one that is the least open to critical objection, and a form of art that cannot be studied on a similar scale elsewhere. If French cathedrals are purer, and Italian palaces more refined, than their Spanish imitations, at least, these lofty and magnificent Rejas cannot be paralleled elsewhere. The example illustrated closes the entrance of the Chapel of the Constable, which occupies the position of a Lady Chapel, at the extreme east end of the cathedral at Burgos.

If not, perhaps, the finest example of the Renaissance form of these grilles, it is probably unique in the possession of the strong buttress-columns on the inside; and is also a closer adaptation of the orders and metal work than other examples which retain more of the character of a railway of metal bars.

S. Gil at Burgos contains the early forms of these Rejas, which there consist of vertical square iron bars, set often diagonally, and framed by occasional horizontals. The spandrels over the gates, and the gate-leaves themselves, first received some ornamental treatment, the crestings soon became important elements in the design, and lastly, the bars became the special feature. The baluster form introduced by the Renaissance is, in a much-elongated shape, of universal occurrence.

In the Transition occur perhaps the most admirable examples of pure metal treatment. That in the chapel of Ferdinand and Isabella at Granada is a screen of metal bars treated in legitimate decorative manner; the hood friezes of decorative cresting, where the grotesques are obtained in repoussée work are full of fancy and elaboration, possessing the lightness with strength that is the character of the material.

As regards construction, in the example given the figures are repoussée, and in duplicate, being applied back and back with free edges. The entablature is thin, and, of course, hollow, the mouldings being tied across by small flat bars. The ornaments are repoussée also, and attached to the frieze and the solid-looking plinth of the gates. These gates are very heavy, but move fairly easily on large pivots. The bars are, of course, all hammered and chiselled iron; cast work is of a later date, and though these forms are closely imitated, the difference cannot fail to be noticed.

The artist's name, boldly inscribed, indicates the importance and value attached to the work.

A. T. B.

DESIGN FOR AN ENTRANCE HALL.

THE design which we publish to-day gained for its author, Mr. H. Seton Morris, the 25*l.* premium for the best set of designs in the Upper Architectural Schools of the Royal Academy.

The subject set by the visitor, Mr. Norman Shaw, was "An Entrance-hall to a large Town House," and the endeavour of the designer was

to convey the necessary dignity and repose, by relying on the beauty of proportion and the material employed, rather than upon carving or decoration.

The lower portion of the entrance-hall, including the pavement, is in black and white marble; the upper part is plastered, pains being taken to keep the arch-mouldings light and papery.

A vista of the central hall is obtained through the small colonnade, as well as through the archway.

Over the chimney-piece, which is in a recess at the end of the hall, a broad circular frieze relieves by the richness of its carving the severity of the main treatment.

CARPENTERS' HALL LECTURES:

COMPARISONS AND CONTRASTS IN ARCHITECTURE.

THE second of the series of lectures now being given at Carpenters' Hall was delivered on the 13th inst., by Professor Banister Fletcher, his subject being "Comparisons and Contrasts in Architecture." Dr. William Smith occupied the chair, and introduced the lecturer.

Professor Banister Fletcher, at the outset, said he thought that the theme of his lecture would afford an interesting subject, because it naturally led them to consider the geographical, climatic, social, political, and religious conditions of each country, and also their influence upon architecture. Dealing first with Egyptian architecture, the lecturer remarked that the Egyptians had plenty of stone and granite, and therefore their tombs, temples, and pyramids were built of these enduring materials. Their temples were not like our churches, which were places of worship for the people, nor like Greek temples, in which case the worshippers stood outside; but they were sanctuaries where only the king and priests penetrated. The earliest temples consisted of one small chamber with statue and altar, approached by a flight of steps, and they were generally considered as the prototype of the Greek temple. These smaller temples were afterwards enlarged by adding chambers for the priests, and courts, colonnades, and halls, all within a garden or court surrounded by a high wall. The erection of these temples was progressing during many centuries by means of continual additions. In this respect they resembled our own English cathedrals, as also in their disregard for symmetry in planning of parts in relation to one another, as in many of the later examples. The walls were immensely thick. In the more important buildings they were of granite, in the less important of brick faced with granite, and the battering inwards of the walls of the pylons was indicative of strength. For the purposes of decoration, the walls, even when of granite, were generally covered with a fine plaster. The openings were all square-headed and covered with a massive lintel, as also the space between the columns. The style was essentially a trabeated style, and the arch did not appear to have been used. Window openings were seldom found in temples, light being admitted by the clearstories above, as in the earlier examples at Thebes, or over the low dwarf walls between the columns, as at Luxor or Philæ. The roofs were flat, and composed entirely of massive blocks of stone laid on to the columns. In the rock-cut temples the ceilings were sometimes slightly arched in form. The architectural character of these temples was striking and characteristic. The buildings decreased in height from front to back, and therefore formed a disconnected collection of various sized buildings, often built at different times, and in direct contrast to the harmonious whole of a Greek temple, which was all comprised within one "order" of columns, and which was distinctly, both in appearance and reality, one building. The face of the temple walls sloped inwards towards the top, which gave it a massive appearance. No columns, which were an especial feature of Greek work, appeared on the outside, but merely a massive blank wall crowned with a characteristic cornice, consisting of a large hollow and roll moulding. These walls in many cases were covered with hieroglyphics. Simplicity, solidity, and grandeur by impression of mass were the chief characteristics. Passing to Greek architecture, the lecturer said the Grecian style was essentially a columnar and trabeated style, in which the graceful column of stone supporting a lintel of the same material was the main feature. The arch was never used by the Greeks, who seemed—if they knew of its existence, as it was believed they did—to have strongly objected to the mixing of constructive principles. Their architecture was a great advance on Egyptian, being remarkable for proportion. Proportion, in fact, was of the first importance to the Greeks; they built in truth, construction was apparent, no mixture of principles was allowed, and trabeated construction was always paramount. Therefore, in Greek buildings, simplicity, harmony, and unity were always to be found. The temples were all built for external effect, in contradistinction to Egyptian, which had all their beauty lavished on the internal courtyards and colonnades, which were not visible externally. The lecturer went on to deal with Roman architecture, which, he said, was founded more or less on the Grecian, although there was a great contrast, for the Roman used the arch as a constructive feature. Besides marbles (almost the only building material the Greeks had) the Romans had stone, brick, and terra-cotta. The main qualities of the people were conquest, wealth, and power, and these were well expressed in their architecture. There was less refinement in design and detail than in the Greek, but buildings were erected for more varied purposes. The lecturer next alluded to the early Christian or Romanesque period, and remarked that the duration of this phase of architectural development lasted from Constantine to Gregory the Great, or from about 300 A.D. to 600 A.D., but from the fourth to the tenth century also the churches usually went by the name of Basilican churches. Naturally, little money was at the command of the early Christians, and so they adopted the ancient basilicas, which were ready to their hand, as their places of worship, and in cases where they erected new ones, they were generally built from the remains of ancient Roman buildings in the vicinity, over the entrances to their former hiding-places or crypts. Thus in these early Christian basilicas in Rome they found columns with various ancient capitals, with shafts of various lengths, with or without bases, and made up by the addition of new pieces of stone, or with double bases. One great feature in early Christian architecture was the baptistery. The form was derived from the circular temples and tombs of the Romans. Originally it was only used for the sacrament of baptism, and until the end of the sixth century A.D., it appeared to have been a distinct building. After this period the font often came to be placed in the vestibule of the church. Having pointed out the different manner in which these baptisteries were treated in various European countries, the Professor next dealt with the Byzantine style, observing that its great contrast with Romanesque was the dome. Passing to Gothic architecture, he remarked that the object of the Gothic architect differed naught from the Pagan architect—in fact, it was curious to note how closely they worked. As examples he mentioned the Parthenon and the Gothic cathedral. The Pagan architect made the perfect enframement of a material god. The personification of the god they worshipped was there, and it only required to give that god a fitting house or temple. How different was the motive with the Gothic architect. There was no visible God to enshrine, architecture with him was to induce the people to look above for the God they were to worship. Grandly they did this by the upward line of the architecture. Every line, buttress, window, tower and steeple emphasised the aspiration heavenward. The lecturer proceeded to refer to the decadence of the Gothic style, and the revival of Roman architecture under the name of Renaissance, or new birth. He pointed out the great contrast between St. Paul's and St. Peter's and the pagan churches. The former appealed not so much to the Gothic ideal, but to the enclosing with the dome of heaven the space of worship. When he first entered St. Peter's he was greatly impressed by its majesty. It seemed to him architecture had achieved its grandest triumph in reducing man to insignificance compared to the God he came to worship, and in whose honour the temple was erected. The residences of this period, compared with those of the Egyptian and Grecian period, showed great contrast. He mentioned Hatfield, Blenheim, Chatsworth, and other mansions of England, and proceeded to refer to the Georgian period, when aspiration upon a grand ideal seemed dead; when the plain square house was the beau-ideal of an Englishman; and when the plainest barn-like church was all that was considered necessary for worship. These prosaic days, he said, were past, and there was again a desire to emphasise worship in some way at least commensurate with its founder, but difficult indeed would it be to rival such buildings as York and Norwich Cathedrals.

At the close the Professor was accorded a vote of thanks for his interesting lecture, which was beautifully illustrated by lantern views.

COLOURED DECORATION OF ARCHITECTURE.

THE third of the series was delivered at Carpenters' Hall, on Wednesday evening, by Mr. J. D. Crace, Hon.A.R.I.B.A., whose subject was "Coloured Decoration of Architecture." Mr. F. C. Penrose, P.R.I.B.A., M.A., F.R.S., presided.

The lecturer, after referring to his practice of the art of coloured decoration having extended over more than forty years, said it could hardly be too often urged that a decorator stood in a very different position towards an interior which could claim some architectural effect to that which he occupied towards a room devoid of architectural treatment. In the latter case he was able to deal with it as so much surface, free from obligation except such as his client might choose to impose, or he might himself feel it desirable to adopt. But it was quite otherwise when he had to deal with a structure which presented characteristic forms and features expressive of constructive intention. He had then the obligation of carefully studying the architectural expression of the structure, of ascertaining which were the features which best assisted that expression, and then of weighing the proper amount of emphasis to be given by colour. All this part of his task was almost entirely independent of the consideration of any particular scale or scheme of colour. It was not at first a question of this or that hue. The first step was a complete recognition of how the values were to be distributed—apart from hue—and where the eye should be encouraged to recognise promptly the form; in fact, to decide what should be explained, as essential to the sense of stability, and what should receive the charm of interest or of mystery. The first and most necessary condition for the intelligent appreciation or enjoyment of any building was an almost instantaneous recognition of its structural form. It was this which produced what was rightly termed the quality of "repose" in a building—that most essential of all the qualities which constituted what was admirable in architecture; for architecture had for its object the production of stability, of matter wrought into beauty, and immovable. They must not think that repose was therefore only to be attained by omitting all ornament. Far from it. Many a noble building was full of detail, with no loss of repose. It was only requisite that the structural forms should impress the mind before the ornamentation. Then it mattered not what labyrinths of detail or what profusion of interest was provided; they but enhanced the beauty, not overlaying it. Here, therefore, began the colourist's responsibility. Apart from all question of colour harmony, he must explain what needed explanation, draw attention to that which was explanatory of the building itself, and be sure that he so handled his colours that none should tend to lead the eye away from the structural framework, nor to impress the mind with other matter before it had grasped the impression of stability. It was necessary to understand what a power for good or evil was colour in a building. Properly used it could help or supplement the architecture; it could do much to remedy omissions or to correct errors of proportion, or it might be used as a substitute for carving or mouldings. On the other hand, when applied without due consideration, be it never so harmonious in itself, it might entirely disturb proportion and repose, or subvert the whole intention and effect of a fine composition. The decorator, then, must be capable of appreciating the architect's intention. If he had these qualities he would not fail to secure attention for the important lines first; nor would he leave them isolated or detached from the larger spaces of the fabric. The spectators's eye must not only be led to the main lines, but must then be induced to traverse—not leap over—the intervening surfaces. This treatment of the spaces between the constructive features was the second step towards the complete expression of an interior. It might be carried out by moulded divisions or panelling, in relief; or it might be accomplished by colour; or again, it might be the result of a combination of relief and colour. But one reason why colour was so useful for explanatory treatment in interiors, and why relief treatment was often insufficient, was this: the admission of daylight was frequently such that the upper part of the building was entirely dependent on reflected, and very diffused reflected, light. Now, very diffused light did not afford such contrast of light and shade on moulded

surfaces as to make them easily intelligible. Colours, on the contrary, were best seen at their proper relative value in a diffused light. When, however, the sufficient explanation or expression of the constructive lines and of the intermediate spaces had been effected, there was yet another purpose for which colour was efficient. This might be described as "accentuation" or "emphasis," but, as in speech, so in architecture, the success of emphasis depended upon its being used sparingly and appropriately. In further remarks, the lecturer pointed out that it not infrequently happened that the keynote of the colouring was struck by some existing condition or circumstance. He observed that the decorator would, as a rule, better show his talent in appreciating and accepting these natural limitations, and making the most of them, than by setting them at defiance. Coming to the subject of the influence of colour decoration on the proportions of an interior, it was to be noted that besides the effect of advancing or retiring shades and tints of colour, it was chiefly in the placing of the contrasts that such influence was to be brought to bear. The comparative dimensions of height and width depended on the position of the strongest line of contrast. Again, much might be done with colour, in producing some impression of actual difference of form or section. It often happened that the flat ceiling of a square room, when plain, appeared to droop or sag in the centre. With colour it was quite possible to not only remedy that, but to make the flat surface appear to rise in the centre. On the other hand, with large unbroken surfaces of flat wall, a very useful office was performed by that framing of vertical and horizontal bands of colour or ornament by which the earlier painters divided their subjects, whether in fresco or mosaic. It would be seen at once that they restored to the expanse of wall that square and firm stability which the pictorial treatment had tended to weaken. As he had touched on mosaic, he would say a few words on that form of coloured decoration. Mosaic was the most magnificent and the most completely decorative of all the forms of coloured decoration. Perhaps, too, it was the one requiring the most judgment, the most discretion in its use. He spoke particularly of the gold-ground mosaic of which so many splendid samples remained in Rome, Venice, Ravenna, and elsewhere. Its best effects were obtained on curved surfaces; or if on plane surfaces, then on such as were not framed in by mouldings, but were rounded off at the openings or external angles. Its great charm lay in the mysterious play of light on large expanses of curved or slightly rounded surface, where the metallic character of the gold was subdued or softened down sufficiently to modify the abrupt transition from metal to colour. It was quite possible to use mosaic for external ornamentation. But it required at least as much care without as within, or it might easily fail to assimilate with its surroundings. In any case, some distance was essential to seeing mosaic to advantage, and nothing could be more blindly inappropriate than the use so often made of it in this country during the last thirty years; he meant sticking bits of it, a foot or two wide, into the sunk panels of a reredos, level with the eye, and on a rigidly flat ground. Some of the noblest decorative work in the world had been done in "fresco"—both false fresco and true; for they must not forget that a very large proportion of what were known as frescoes, Italian and other, were nothing more than paintings in distemper. In country air and on a dry soil, fresco would last many a year. But the immense difficulties in its execution were not likely to encourage many practitioners, and a method unsuited for towns would hardly be worth pursuing in this country. Still, with very moderate protection the use of coloured decoration was quite possible, and might more often be used in external treatment than it was—at any rate on stuccoed buildings. The fresco paintings of the 13th, 14th, and 15th centuries were executed, almost without exception, with a view to decorative effect. Later on, when a more purely pictorial and less decorative system prevailed, it was usual to introduce such architectural features in the picture as would serve to connect it with the actual structural surroundings. Gradually, however, artists sought only to surprise the beholder by the pictorial excellence of that which was best when not purely pictorial, and within a very short period all sense of decorative fitness seemed to evaporate. It was no longer the object of the painter to beautify the architecture; his aim was to astonish by his artifices, and it was soon found that, instead of the decorations helping the architectural expression, they positively interfered with it. In that impatience of control, that fatal desire to be free from limitations, which seemed destined to be the eventual ruin of all human aspirations, the truest nobility of art perished. The best art of all ages had been that in which its own limitations had been frankly recognised. As decorative art thus rapidly deteriorated in Italy, where it had attained unexampled perfection, a very real, though less noble, variety was developed in France, and influenced all Europe. It might fairly be said that the root of its success lay in its strict determination to be decorative; that was to say, destined to beautify something other than itself. Whatever might be the feeling about the decorative art of Louis XIV., no one could doubt that its merit lay in the skill devoted to decorative purpose; and, though it was undoubtedly exuberant and pompous, as its patrons required it to be, this was not through any disregard of its real purpose. It was splendid and boastful, no doubt, but it was so in true alliance with the buildings to which it was applied, and it successfully performed many of the proper functions of decoration. But was it possible that now, at the end of the 19th century, under the mad impatience of control, the French were losing this talent for making beautiful? He confessed he suspected this to be the case. The art which abandoned its ideals and ignored its limitations could never become noble. In this country we had but fragmentary examples of coloured decoration; they were, indeed, rather evidences than examples, so far as colour was concerned. But we were rich in examples of a fine decorative instinct; at least, down to the time of the Stuarts. For decorative treatment of large expanses of surface nothing could beat the old Tudor panelled ceilings or the "strap" work of Elizabeth's time. Concluding, the lecturer said, the man who set out to decorate architecture had clearly one very plain duty before him. Before everything else it was his duty to do that which was best for the building. No elegance of ornament, no ingenuity of symbolism, no originality of colouring which digressed from this main purpose would find any justification in the result. For good or evil, colour was a power. Let it be wielded with care and with due sense of responsibility. Then, if the skill be there, he who wielded it should seem to possess, indeed, the magician's wand.

The lecture was illustrated with lantern views and several drawings, but Mr. Crace pointed out the difficulty he experienced in dealing with such a subject as he had chosen, from the impossibility of putting any illustrations in colour before a large audience. He was heartily thanked at the close by the Chairman, who remarked that no mention had been made of scraffito work. In reply, the lecturer admitted the omission. He added that scraffito work was a very legitimate treatment for external purposes and one that, perhaps, had hardly received sufficient recognition.

THE LONDON COUNTY COUNCIL.

The usual weekly meeting of this Council was held on Tuesday, in the County Hall, Spring Gardens, Mr. Arthur Arnold, chairman, presiding.

New Committees.—The first business that occupied the Council was the appointment of the standing committees. The following are the names of the gentlemen who will form the Building Act Committee and the Works Committee, respectively.—H. T. Banning, E. Bond, W. Davies, Lt.-Col. C. Ford, C. Jerome, G. B. Longstaff, W. H. C. Payne, G. H. Radford, R. Roberts, R. Spokes, R. Strong, H. R. Taylor, J. White, W. B. Yates. Works Committee—R. C. Antrobus, G. Bicker-Caarten, J. Burns, T. Catmur, J. Dixon, E. B. Ellice-Clark, W. H. Fox, W. Goodman, E. A. Goulding, A. Hoare, Hon. L. R. Holland, A. Humphrey, Robert Lyon, H. H. Marks, Viscount Mountmorres, W. C. Steadman, H. R. Taylor, J. Thornton, H. Ward, E. White.

New Fire Brigade Station at Fulham.—The paragraph in the Fire Brigade Committee's report relating to the proposed new Fire Brigade station at Fulham, which we printed last week, page 205, gave rise to some discussion.

Mr. Westacott moved to refer the recommendation back to the committee, with an instruction that tenders should be advertised for in connexion with the work. It had several times happened that tenders had been received from contractors for amounts lower than those at which the Works Committee were prepared to do the work.

Mr. Beachcroft seconded the amendment.

Mr. Fletcher, in supporting the amendment, said that in the case of certain works carried out by the Committee, the cost had been 52,000*l.*, whereas it would only have been 48,000*l.* if contractors had been engaged.

Mr. Ward said the figures given by Mr. Fletcher were misleading, because no allowance was made for extras, and there ought to be at least 10 per cent. added for extras on works contracted for. The Works Committee, on the other hand, were not allowed anything for extras.

Sir Blundell Maple, M.P., said he was sent to the Council pledged to see that the Works Department was made to compete with outside contractors, and he was determined to see the Department justify its existence.

Dr. White contended that they were bound to get the work done as cheaply as they could. The Works Committee should tender in the ordinary way, and if their tender was the lowest they should do the work, but not otherwise.

After further discussion the Council divided, when there voted for the amendment fifty-six, against it sixty-two.

The report of the Committee was then agreed to.

ARCHITECTURAL SOCIETIES.

EDINBURGH ARCHITECTURAL ASSOCIATION. On the 16th inst, the members of the Edinburgh Architectural Association visited the village of Upper Liberton, and were conducted over Liberton House, the former residence of the Littles, the owners of the Barony, by Mr. G. Godfrey Cunninghame, advocate, the present occupant. The attention of the party was directed, in the first place, to the ground plan of the house, consisting of two blocks of building at right angles to each other, with a circular turret or tower in the angle, these, together with another block or annexe, enclosing on three sides a small square courtyard, the fourth side of which was once shut in by a wall and a gate of defensive character. The special interest attaching to Liberton House lay in the fact that it belonged to a transition period, when defensive architecture, even in the case of structures without any claim to rank as a castle or fortress, had not yet been wholly abandoned, and when the state of society made it necessary to retain safeguards against sudden attack. Though disfigured externally by an alteration in the height of the walls, which had been considerably raised, and in the pitch of the roof, which had been depressed, the outlines of the original elevation were still clearly traceable. Lastly, the "Nelson room," a reconstruction of recent date, was explained to be an attempt arising out of structural considerations to introduce the half-timbered work associated, at least in Scotland, more often with the exterior than with the interior of the edifices in which it occurs. At the close of the visit, the President, Mr. W. W. Robertson, F.S.A.Scot., proposed a vote of thanks to Mr. Cunninghame, which that gentleman duly acknowledged.

ARCHITECTURAL SECTION OF THE GLASGOW PHILOSOPHICAL SOCIETY.—The closing meeting of the session of the Architectural Section of the Glasgow Philosophical Society was held on the 18th inst., Mr. T. L. Watson, F.R.I.B.A., President, in the chair. Mr. Lewis R. Crosskey, of Glasgow Technical College, read a paper on "Industrial Art, with special reference to the Training of Artisans." The art instruction given at industrial art classes, he said, must bear directly on trade requirements, and that could only be given by men having a complete knowledge of the trade. It could not be given by a teacher who had only a general knowledge of art matters. It must be given by one in close touch with the trade to which the student whom he is teaching belongs. In a discussion which followed, Mr. A. Lindsay Miller spoke in support of the view of the municipality helping trade technical schools. They could not in this country equal many varieties of German-made goods, and the secret of it was the splendid system of technical instruction carried on in special schools by the Government of that country. At the close of the discussion the annual business meeting was held. Mr. T. L. Watson was afterwards re-elected as President, as also was Mr. William Howatt as treasurer, and Mr. A. Lindsay Miller as secretary.

ARCHÆOLOGICAL SOCIETIES.

LONDON AND MIDDLESEX ARCHÆOLOGICAL SOCIETY.—At a recent meeting of this society, held at its new offices, the London Institution, Finsbury Circus, Mr. John Watney, F.S.A., presided. The Rev. H. D. Macnamara, M.A., Rector of St. James', Garlickhythe, read a paper

on "The Records of his Parish;" these, he said, were gathered from the parish books of St. James, Garlickhythe, St. Michael, Queenhithe, and Holy Trinity the Less. In the last-named, neither the first visitation of the plague nor either the two subsequent ones was very fatal in the parish. Henry Machin, the diarist, was clerk of the parish church, and was referred to. The parish record of St. James, Garlickhythe, dates from the year 1535, and is one of the two oldest books in the City. Mr. Charles Welch, F.S.A., read a paper entitled "The Tackle House, and Fellowship Porters of the City of London," and said, one of the most ancient rights possessed by the Corporation was that of metage, and that while special provisions were made for the metage of coal, the right of metage of other articles was exercised by the Corporation through the Company of Porters, who were variously styled Billingsgate Porters, Corn and Salt Porters, and sometimes Fellowship Porters. They were never incorporated as a Company, but being servants of the Corporation, were regulated by orders made from time to time by the Court of Common Council. The Fellowship was said to have existed from the time of Edward I., but the regulations which were till recently in force for the government of the Fellowship were contained in an Act of the Court of Common Council, dated October 5, 1620. Before that date the body was governed by the Court of Mayor and Aldermen. The circumstances attending the disbanding the Fellowship of Free Porters, the forcible seizure of the Hall, and the discontent aroused by the delay in the distribution of the effects, are modern history, all this having occurred about twelve months ago. Votes of thanks to the readers of the papers closed the meeting.

ENGINEERING SOCIETIES.

INSTITUTION OF CIVIL ENGINEERS.—The Development of the Experimental Study of Heat Motors is to be the subject of the "James Forrest" lecture this year at the Institution of Civil Engineers, the lecturer being Professor W. C. Unwin.—At the ordinary meeting of the Institution on the 19th inst., Sir Benjamin Baker, K.C.M.G., Vice-President, in the Chair, the paper read was on "Steam-Engine Economy: Condensing Engines," by Mr. Henry Davey, M.Inst.C.E.

CIVIL AND MECHANICAL ENGINEERS' SOCIETY.—On the 14th inst., at the ordinary meeting of the Civil and Mechanical Engineers' Society, a paper on the subject of "Passenger Lifts" was read by Mr. S. à Court, A.M.Inst.C.E., Vice-President. Having referred to the earlier forms of passenger-lifts in use in England, the author gave details of various improvements lately introduced, such as the variable power hydraulic and the electrical systems, and gave figures to support his view that the latter has already shown by practical working that at even present prices the electric lift is a serious competitor with the hydraulic lift. Safety appliances and possible causes of accidents were then detailed, and mention was made of the recent fatal accident in the City. The author estimated that, on an average, fully ninety millions of passengers are carried annually in London alone, and pointed out that the percentage of accidents is extremely small. In the author's opinion, with the present prices for power, the electric system has been proved, for individual lifts, to be fully as cheap as the best form of variable power hydraulic lift.

Books.

The Scientific and Technical Papers of Werner von Siemens. Vol. II. Technical Papers. Translated from the Second German Edition. London: John Murray. 1895.

THIS volume contains the technical papers contributed by Dr. Ernst Werner von Siemens to various learned societies, and also descriptions of his inventions. As a record of the useful and active life of one of the most distinguished electrical engineers, it is an invaluable book. It is now more than two years since his death, yet his loss is still fresh in the memory of all the engineering world. That he was a shrewd man of business the firm of Siemens & Halske which he founded amply shows, yet he found time amongst all the cares of business and the fever of invention to study and write on many social and philanthropic problems.

To describe even briefly the many interesting inventions given in this volume would fill many pages; we shall confine ourselves to those which have attained a world-wide reputation.

In the early days of telegraphy great difficulty was found in working over long distances, as, owing to the leakage of current, the magnetism produced at the receiver was too weak to work the moving lever. As far back as 1848 we find that Siemens had invented a relay which allowed of automatic communication between neighbouring telegraph circuits. The note in which this is given is entitled "The Oldest Relay!" This is misleading, as Cooke and Wheatstone patented eleven years before this a relay to work the alarm in connexion with their five-needle telegraph. Of his other achievements in practical telegraphic work we may mention a dial and printing telegraph, the polarised relay, a system of duplex telegraphy, apparatus for localising faults in cables, and a battery of great constancy which is very extensively used.

The crowning invention of his life was undoubtedly the self-exciting dynamo, which he made in 1867. He seems even then to have had very clear ideas of the importance of the dynamo, and the kind of work to which it could be applied. He bitterly resented the attempt made by a few engineers in this country to give all the credit of the invention to Wheatstone and Varley, just as later on he resented the remarks made by a prominent English electrician disparaging his armoured cables. That he had good cause to be angry will be seen by the short notes published in this book explaining his case. The Siemens system of armoured cables is by far the most widely used in Europe. The insulating materials are cheap, and the possibility of laying the mains directly in the earth is of the greatest convenience.

The differential arc lamp which he invented was the first of the immense number on similar principles which have been patented since. Amongst other electrical inventions were meters, an electric hammer, a plough, lifts, and numerous improvements in connexion with electric traction; in fact, the first successful experiments on electric traction were made by his firm in Berlin in 1879, since then over 300 towns in the United States alone have adopted electric tramways. He employed electrolysis to obtain pure copper from ordinary commercial copper, which, as is well known, contains iron, arsenic, silicon, and many other impurities. By electrolysing a solution of copper sulphate and using the impure copper as the anode, almost all the impurities are left on the anode or deposited as mud at the bottom of the solution, whilst pure copper is deposited on the kathode. His classical experiments on the temperature of the electric arc are well known, he proved that it could melt the most refractory metals. The director of a Belgian company which worked zinc ore in Spain once asked Siemens for a machine that would separate the magnetic from the non-magnetic ores; the machine he made for them answered its purpose perfectly, separating a ton of ore per hour.

Of his numerous non-electrical inventions perhaps the best known is the pneumatic despatch, a method of transmitting small parcels of letters which is used in our own Post Office, and is also largely employed abroad. Others are an alcohol-meter, an anemometer, and an apparatus for the continuous measurement of the speed of ships. No wonder that Mr. Fletcher Moulton, Q.C., one of the jury at the International Exhibition of Electricity at Paris in 1881, said, after examining the marvellous exhibit of Dr. Werner Siemens, that he seemed to be waiting for the world to come up to him, to such a high degree of accuracy had he brought his instruments.

His military inventions are also given in this volume, and several very interesting general papers, the best known of which are "The Age of Natural Science," and "On the Possibility of Producing Food Stuffs by means of Electricity."

Electric Light Installations. Volume III. Application. By Sir David Salomons, Bart., M.A. Seventh Edition. London: Whittaker & Co. 1894.

IN the first volume Sir David Salomons dealt exclusively with accumulators and in the second with apparatus used in electric lighting. In this volume various methods of working are given and many mechanical details which are interesting to both engineer and workman. A little previous knowledge is assumed on the part of the reader; he is supposed to be familiar with every-day appliances like cut-outs and switches and to know roughly the difference between an alternating and a direct current. It is an excellent book of reference for anyone who is in any way connected with electric lighting, all the information being thoroughly up to date. The rules and regulations for the prevention of fire risks as issued by the Institution of Electrical Engineers are given as well as the rules of various other authorities for insulation resistance. The chapter on estimates will prove a very useful one, enabling an architect to check any specification for the electric lighting or wiring of a building. We rather wish that the remarks dragged in about the possibility of the existence of life being simply an electrical phenomenon had been omitted—they are singularly out of place in this useful little book.

Electric Lighting and Power Distribution. By W. PERREN MAYCOCK, M.I.E.E. Second Edition. London: Whittaker & Co. 1894.

THIS book is primarily intended for students preparing for the ordinary grade examination at the City and Guilds of London Institute. It is admirably adapted for this purpose, the syllabus on electric lighting and power distribution being followed. With the minimum of labour any intelligent student would be able with its help to prepare himself for the above examination. It will also prove useful for those who wish for short general descriptions of the latest forms of electrical apparatus. As a purely educational book it is of no great value, but this is not Mr. Maycock's fault, but the fault of the system which places a premium on knowledge which can be acquired in an easy-chair. It has many of the faults of a "cram" book—too great a partiality for uncouth words like myriaohm, decimegohm, megmho, &c., and a tendency to give ambitiously worded questions to be answered from the context as: "What is the difference between the systems of the Metropolitan and London companies? Give reasons." Of the sort of electricians this kind of thing turns out in a month or two we have had ample experience. On p. 99 there is a mysterious picture called "Fig. 58, Swinburne's N. Type Voltmeter," with a still more mysterious footnote: "N.B.—There is no fig. 59."

Electric Lamps and Electric Lighting. By J. A. FLEMING, M.A., D.Sc., F.R.S. London: The *Electrician* Series. 1894.

THE lectures given by Dr. Fleming to afternoon audiences at the Royal Institution on electric measurements, glow lamps, arc lamps, and distribution created a considerable amount of interest at the time, and he was well advised to publish them in book form. The industrial applications of electricity nowadays are so numerous that everyone should have some knowledge of the principles underlying them. The book is well printed and illustrated, and the information is imparted in an interesting and attractive form. Dr. Fleming has added another claim to the gratitude of those who have the interests of popular education at heart.

TRADE CATALOGUES.

MESSRS. YOUNG & MARTEN send a large and very elaborately-got-up catalogue of grates, grate-tiles, ships' grates, kitcheners, &c., of which the practical portions are very useful, and the whole catalogue is a credit to the enterprise of the firm; but of the so-called ornamental grates, for the most part, the less said the better. It is a pity that large and wealthy firms cannot see that it would be worth their while, as a remunerative outlay, to get someone who is really an artist in metal-work to design such things as ornamental grates. Designs like most of those in this catalogue may be popular with builders and "the trade," perhaps even with the average Englishman, but they can never recommend a catalogue to architects.——We cannot say much more for Messrs. A. Boyd & Sons' "Registered designs of uncommon fireplaces"; the best are, as usual, the simplest, such as Nos. 170a, 152a, 427a, 435a, and 411a; these are pleasing, and are suitable specimens of metal-work treatment for the purpose.——The Volta Works (Leicester) send us their catalogue of electric bells, indicators, telephones, and electrical apparatus.——From Messrs. J. M. Bennett & Sons, Manchester, we have an illustrated list of sections of mouldings for cabinet-makers (Catalogue No. 1, Series H).——Mr. J. Stannah sends us an illustrated catalogue of hydraulic and electric passenger-lifts, with illustrations of construction and mechanical working, and remarks in explanation of various points in their working; a very useful catalogue.——The Safety Tread Syndicate send us their illustrated catalogue of non-slipping stair-treads, hydrant and manhole-covers, coal-plates, &c.——The Beeston Foundry Co. (Beeston, Nottingham) send us their illustrated catalogue of radiators, which contains

views and sections of various forms of radiator with some useful suggestions in regard to fixing and looking after them. The company have arranged an easy means of cleaning the inside of double radiators by providing for the temporary removal of the base, when the radiator can be thoroughly dusted and cleaned. In hospitals, as they observe, this is very important.

Correspondence.

To the Editor of THE BUILDER.

CARDIFF, SOUTH WALES, AND MONMOUTHSHIRE ARCHITECTS' SOCIETY.

SIR,—In your issue of the 9th inst., certain comments appear with reference to the action of this Society in requesting the Cardiff Museum Committee to invite designs in competition for the proposed new building in Park-place. Your unfavourable criticism of the Society's action leads me to suppose that in forming an opinion you have not had the advantage of an unbiassed or truthful statement of facts, or such words as "very unprofessional and very discreditable" would never have found a place in your comments. I enclose for your perusal the correspondence which has appeared in the local papers, which will explain itself, and from which you will see that the Memorial to the Committee contains nothing whatever which can be construed as dishonourable or reflecting discredit upon the Society. The Memorial runs as follows:—"That the Cardiff, South Wales, and Monmouthshire Architects' Society memorialise the Cardiff Museum Committee to the following effect:—'That unless they have already pledged themselves to any architect, they should invite a public competition for designs for the new Museum Buildings proposed to be erected in Park-place, the competition to be under the rules of the Royal Institute of British Architects."

It should be noted that the proposed new buildings are no part whatever of the scheme for the extension of the Public Library Building, for which Mr. Seward is the architect, but are to be erected in another street nearly half-a-mile away, and the Corporation is under no moral or legal obligation to entrust the work to Mr. Seward. It cannot be denied that Mr. Seward, being a member of the Museum Committee, has given advice to the Committee, and may have been benefitted in return in certain ways, but this fact does not necessarily constitute him architect of the proposed buildings; and if what he terms an "honourably acquired *engagement*" be more than a mere self-appointment, the Committee, which must be considered a body of honourable men, is not likely to pass him by in consequence of the action of the Society, nor would any member of the Society wish it. This being so, Mr. Seward has exhibited very bad judgment and ill-feeling in forcing this matter before the public notice, and in making charges of so grave a nature against the members of the Society, thus seeking to injure its reputation. As President of the Society I consider it a duty, although a thankless one, to do my utmost to vindicate the honour of the Society, and to maintain that there has been nothing discreditable or unprofessional in the course it has taken; and I feel sure that you, Sir, in the interests of fairness and truth, will give the necessary publicity to my statement of the case.

E. M. BRUCE VAUGHAN.

Cardiff, March 15, 1895.

THE TRADE UNIONS AND THE EDUCATION CONFERENCE.

SIR,—Will you permit me through your columns to show how the difficulty at issue in the above question strikes an outsider who has followed the Conference with interest.

1. While agreeing in the main with Mr. Fleming's letter and the speeches of like tenor reported by you, I would venture to suggest that it is not altogether fair to attribute to the Trade Unions the raising of a *political issue* by this action in retiring from the Conference. The question was one of status. The status of the Free Labour Association considered in its bearing on education, and the status of the Trade Unions similarly regarded in the event of their being put on a par with any other body that might appear to be wanting in genuineness.

2. The point raised by Mr. Verdon and the instance he quoted, seems to me to fully justify the determination of the Trade Unions to have nothing to do with a body open to this imputation.

3. While, however, agreeing with them on the principle, and also in the desire to bring the question to a head, I consider that in their method of going to work they were quite wrong. Their representative, as well as the Free Labour representative, came to the Conference by invitation, and, as Mr. Mountford rightly observed, they should have sent in a notice of their intention to retire before hand.

4. While, however, criticising the Trade Union representatives for their method of action as guests, I hold that the conveners of the Conference were quite as much to blame in their action as hosts. It was they who were responsible for the genuineness of the representation at the Conference. If the facts adduced by Mr. Verdon are true, it would seem to imply an almost culpable ignorance on the part of the architects whose duty it should have been to discover beforehand the status of the Free Labour Association and its claim to representation on educational questions.

5. While, therefore, expressing the hope that the Trade Unions will recognise their error of method, and continue to act on the Conference, we architects may surely, not unwisely, take this opportunity of looking more carefully and with less bias into the fundamental difficulties that underlie Trade Union questions. Whatever their defects and limitations may be, it is only through the Trade Unions that we can solve the educational problems with which the Conference is trying to deal. We should, therefore, it seems to me, not only meet the Trade Unions, as we have sought to do, unreservedly and frankly, but, by sympathy and study of the difficulties that most nearly concern them, avoid any suspicion of ungenuineness, or even covert hostility.

C. R. ASHBEE.

SIR,—As a constant reader of the *Builder* and one who takes a deep interest in educational questions generally, and in technical education in particular, permit me to offer a few remarks on the above question, and the deplorable action of the trade unionists in withdrawing from the Conference. Should they persist in staying away, it will be nothing short of a disaster, as the only way for a conference of this sort to result in some permanent good is for its basis to be as broad as possible, so as to be in touch with every phase of every difficulty that is likely to arise. Trade unionists are identified with the practical aspect of the building trade, and the architects with the theoretical; each of them is intimately acquainted with certain difficulties that present themselves to them; and, as an opportunity has at last been offered for these two sections to have a free interchange of opinions on a basis that should be acceptable to both, it is to be hoped that the present difficulty can be surmounted, owing to the important issues at stake.

Now, as a sort of connectlng link between the two sections, I sympathise with both, owing to the turn things have taken. I do hope that the Trade Unionists will, on reflection, reverse their previous decision, and allow their delegates to return, in order to continue a work that is pregnant with possibilities for good. I hope that the conveners of the Conference will also reconsider their decision in one particular. According to your last report some twenty-three delegates, representing about seventeen Associations, were present, and it surpasses my comprehension to understand by what process of reasoning the Builders' Foremen and Clerks of Works Association has not been invited. It requires a good deal of ingenuity to pass them, as both of them fall in quite naturally between the architects and workmen, and surely no one would seriously say that they have been left out because they have no men qualified to take part in such a Conference; as an accident, it is untenable, as a design, unjustifiable.

JOHN DAVIES.

*** We have already said that we think the Builders' Foremen and Clerks of Works Association should have been invited. We believe the omission arose mainly from a desire to avoid complicating the discussions by extending them too much. But the Association in question certainly has a special claim.—ED.

THE APPOINTMENT OF RURAL DISTRICT COUNCIL SURVEYORS.

SIR,—I should esteem it a favour if you would allow me space in your next issue to say a few words as to the appointment of surveyors under the Local Government Act, 1894. I quote first of all a case in point.

The Hailsham Rural District Council require a surveyor; their district comprises eleven parishes, with an area of 55,128 acres and a mileage of from 250 to 300 miles of district roads to superintend and maintain; the surveyor is to bear the expense of everything conected with his office, not to be engaged in any work of a private nature, to provide means of getting about his district; this means he must keep a horse, which, putting it at the lowest, will cost him 30*l.* a year, he must also find a guarantee in a sum to be fixed by the Council for the faithful discharge of his duties. and for all this he is to be paid annually the most magnificent sum of 120*l.*, less the 30*l.* for horse 90*l.*, equals 1*l.* 14s. 7d. per week, which is less than the wages of a bricklayer per week, and considerably less than a foreman of scavengers would receive; and for this sum he is bound to be answerable for the proper maintenance of, and the construction of sewers, culverts, bridges, highways, and everything vested in the Authority.

After men have been at the expense of receiving an education, at the expense of being articled, making themselves qualified as sound practical men for such offices, it is a disgrace to offer them such salaries.

I think that everybody knows that if you pay one labourer 4½d. per hour and another 5d. per hour, you will get considerably more and better work out of 5d. per hour than 4½d. per hour, and so it is with surveyors.

Medical officers and sanitary inspectors are partly paid by the Local Government Board; why not the surveyors? And why cannot their salaries be entirely fixed by the Local Government Board? It appears that many Authorities do not understand the value of a practical man, and the very responsible position he holds, or they would never offer such mean salaries.

I have in my mind a Rural District Council who pay their surveyor a good salary (they are few and far between), and treat him as a good, practical man; not only does the Authority benefit, but the ratepayers at large.

THOS. PHILIP BAYLIS, Assoc.M.Inst.C.E.

SEWAGE PRECIPITATION.

SIR,—I should be very much obliged to any reader of your paper who could give me the names of any towns that are, to his knowledge, successfully disposing of their sewage by means of precipitation.

F. W. KINNEIR TARTE.

The Student's Column.

BRICKS AND TERRA-COTTA.—XII.

DURABILITY OF BRICKS.

TAKEN as a whole, bricks are more durable than stone, and that is not to be wondered at considering the peculiar effects of hard burning in really good bricks. If anything of an easily perishable nature exists in the raw clays, or in the ingredients added to them in the process of manufacture, it is frequently so much modified by the partial fusion and agglutination consequent on hard burning, that it is no longer affected by weathering agents. In the last article we quoted a case where a large quantity of lime being present in the clay of a certain brick-earth, instead of being regarded as a nuisance by reason of its weathering propensities, was actually turned to account, making rather better bricks than usual on being properly burned in intense heat. It would, therefore, seem that the durability of bricks is largely bound up in the degree of heat to which they have been subjected in the kiln. Given the same raw material it is possible to produce either an exceedingly durable brick therefrom, or the reverse. And this is perfectly true within limits. We must remember that certain raw earths may be burnt up to practically any heat without actually melting, but there are others, capable of producing bricks far above the average quality, which would twist and warp during firing unless the latter were kept within certain temperatures. The kind of earths employed in the manufacture of the average building brick have to be burnt with much circumspection, otherwise they would not only become deformed in the process, but it would be impossible to produce uniformity in colour. Under these circumstances we note that certain deleterious ingredients are not rendered proof against the action of the weather, as they are not sufficiently burned to cause them to be incorporated or to enter into chemical combination with other compounds in the brick.

The durability of a brick is often modified by the particular kind of fuel used in the kiln; of course, we are not speaking of muffled furnaces where the materials might be said to be baked rather than burned, but to kilns properly so-called. We do not intend at the present time to enter into a disquisition concerning the nature and properties of divers kinds of fuel; it may be pointed out, however, that certain chemicals given off during combustion are apt to affect the ingredients in the raw earths and to bring about results by no means contemplated in the first instance. When ordinary pit coal is used, the sulphur driven off, derived from iron pyrites, is usually considerable. Unless the manufacturer possesses sufficient knowledge of chemistry and metallurgy, it behoves him to accustom himself to using one particular class of coal. A great deal has yet to be learned concerning the precise changes brought about in the kiln; in time to come more advantage will be taken of the special properties of different fuels than is done at present. The preparation of the raw earths will be carried out in view of the changes to be wrought in them by the employment of certain fuels as much as by the interaction of their ingredients upon one another. Fuels

chemically prepared to bring about definite results will assuredly be extensively used by the makers of high-class bricks. Whilst speaking of this matter, we may note that in 1887 experiments in burning bricks with oil as fuel were carried out by a Chicago firm. The oil was tried with kilns containing over a quarter of a million bricks, and it was ascertained that the same earths burned more perfectly and with greater uniformity in colour with the oil than with coal. Moreover, the ingredients became better agglutinated, and it was officially stated that the product was more durable. Further, but this applies, of course, more particularly to the United States, the use of oil enables the brick manufacturer to dispense with considerable high-priced labour at the kilns, and the time of burning is shortened by about two days.

Perhaps the greatest influence brought about by burning in regard to the durability of bricks is in the method of increasing the heat. After the moulded and partially dried bricks are built up within the kiln a slow fire is lighted to further dry them, as they must be quite dry (or as near as may be). Now, it frequently happens, as remarked in another connexion on a previous occasion, that the bricks are slightly cracked during the air-drying process. If these are subjected in the kiln, at first, to any higher temperature than that of the open air from which they have just been brought, the cracks are sure to become wider. The heat must be very gradually applied, not by fits and starts, as is done apparently in some brickyards we have visited. It is commonly understood that a slow fire has to be kept up until moisture has ceased to rise from the kiln, and then it is believed to be the correct thing to arrive at a very high temperature as soon as possible. A very little consideration will show that this is by no means the proper way to burn bricks. From the moment they leave the moulder's hands, or the machine, they commence to dry—*i.e.*, to part with moisture. The latter exists in the earth in two conditions, between the minute particles, and in them; in other words, moisture exists interstitially and in chemical combination. Neglecting the latter condition for a minute, we note that moisture in the former case renders the clay plastic—it acts as a lubricator by which the particles are urged to slide over each other on the application of force. It is this which primarily disappears when the brick is dried and the moisture in the outermost portion of the brick goes before that in the inside. In the drying it will thus be noted that unequal contraction is produced, and great strain, under the most favourable conditions, is set up within the brick. If the drying takes place too rapidly, the energy developed by the straining overcomes the adhesion of the particles along lines of weakness (produced by the same action) towards the exterior of the brick, and the effect of the rupture becomes apparent in the creation of cracks. It is impossible to prevent the exterior from drying before the interior, though we can retard the progress, and practically remove all traces of the conflict by drying very slowly. The gist of what has just been remarked is common knowledge with most brickmakers, but it is singular that so few of them carry that knowledge from the drying sheds into the kiln. The first application of artificial heat leads to the creation of a much higher temperature than is found outside, and the brick which may have been properly air-dried at first begins to "sweat," and greatly-increased unequal contraction now makes thin cracks. We need not follow the burning throughout; sufficient has been said to show the necessity for the very gradual application of heat during the initial stages.

When practically all the interstitial moisture has disappeared, the firing should yet, for a time, be very gradual, and for another reason. The brick has now become materially contracted as a whole, in size; shrinkage has slowly taken place up to this point. But it now commences to expand; the expansion must take place slowly, not suddenly, else cracks will be formed from that cause, especially in the coarser qualities of brick-earths. When great heat has been attained, the chemical changes taking place may lead to some of the earlier formed cracks being filled up, or re-cemented by agglutination, or partial fusion; though it may well happen that by the same process the minute breaches may be widened—depending on the homogeneity and thoroughness of grinding of the earths in their preliminary preparation. Assuming, however, that the bricks have passed through the ordeal up to the present stage in a thoroughly satisfactory matter, there is yet another and a worse enemy lying in wait for them, capable of forming larger cracks than either of the foregoing. We allude to the cooling process. Subjected to in many instances extremely high temperatures, the bricks, at the moment the burning is completed, are much expanded, and they must be very slowly cooled, or contraction will take place too rapidly, and cracks, which must ultimately remain in the bricks, are formed. The method commonly adopted in cooling is to let the fires go out too suddenly, and the comparative freedom from cracks in bricks turned out by the best manufacturers is due to the circumstance that the makers are not afraid to use a little extra fuel to finish the burning properly.

Before stating in what way cracks in bricks affect their durability, as distinguished from their strength, we cannot help calling attention to the deleterious effects consequent on stamping the maker's name, or some device as a trade-mark, or indenting the brick in any way. We have no hesitation in saying that without these advertising media, or without the hollows, many bricks would be better in quality, certainly fewer cracks would form. We exclude from these observations bricks from certain earths of a superior kind from which terra-cotta, pottery and fire-bricks are made—our remarks more particularly apply to ordinary kinds. During the past few months a great number of different kinds of bricks have been forwarded to us by manufacturers, and it is quite easy to see, from a careful inspection of them, that the devices indented have, in many cases, formed points from which minute cracks radiate. From other surfaces of the same bricks not possessing cracks of any importance, or, at any rate, from their not being disposed in radial aggregates, there seems to be no doubt that the most dangerous class of cracks, as affecting durability of the material, are induced to form by the indentations referred to. In the case where bricks are broadly channelled, or where one surface is hollowed out, it is interesting to note the formation of cracks in the depths of the hollows following along definite lines of weakness. It is quite evident from a mathematical consideration of the position of these cracks with reference to the shape of the hollows that they arise in the majority of cases from too sudden cooling; and in this particular instance our remarks apply not only to ordinary building bricks but to those used for paving and as firebricks, excluding only those which are vitrified.

We have promised not to say much concerning the commonest class of bricks, but we cannot help remarking that in these and in those of a rather better character in which small coal, &c., is introduced to assist in "thoroughly" burning, the strain set up locally, caused by unequal contraction and expansion about small pellets of coarse material and around the pieces of breeze, is such as to lead to the formation of large cracks.

Now, then, as to how far and in what way cracks in bricks affect their durability. The problem is not quite the same as with stone, and it will be interesting to note the differences. By some it will be taken for granted that the development of cracks is a bad sign. We are far from saying that they denote excellence of manufacture, but the precise amount of damage they lead to in the weathering process is by no means regulated by either their size, disposition, or comparative abundance, in many bricks. If we examine, under the microscope, a piece of building-stone, say a limestone, or granite, we observe that any cracks that may occur end very gradually in the stone, and that the micro-structure of the material at the end of a crack does not differ from that of the rest of the stone. If we now examine the termination of cracks in bricks, we see that one of two things happens, either the structure is the same as in other parts of the brick, or a sort of belt or collar of substance better agglutinated and fused together than in the body of the brick, makes its appearance. The practical value of this discovery—for it is the first time this peculiarity has been noticed—lies in the circumstance that whereas in stones, and certain bricks of average quality, cracks once begun are induced to continue opening in the same direction, in other and better class bricks cracks are prevented from so continuing because a barrier has been thrown up to arrest their progress. The expansion of ice in cracks of bricks, during cold weather, would in the former case tend to the further development of the cracks; but in the latter the action would be considerably impeded, or entirely arrested. We have observed these two structures in one and the same brick, but rarely; and although we have not yet submitted the matter to practical tests we are at present of opinion that those cracks terminated by an agglutinated belt or zone were produced prior to the advent of the most intense heat to which the bricks were subjected in firing, and those not thus terminated were produced in cooling. It would appear as though the sides at and near the ends of the cracks in the former case were re-fused by the introduction of greater heat along the more open part of the cracks. We have not observed this re-fusion or agglutination where the cracks were induced to form by indentations on the surface of the bricks. This is another instance of the application of the microscope in testing the durability of building materials.

GENERAL BUILDING NEWS.

CORPORATION SWIMMING BATH, BRIGHTON.—On the 12th inst. the Brighton Corporation Swimming Bath was opened by the Mayor, Alderman W. Botting. The bath, which has been erected and equipped at a total outlay of 8,000*l.*, has been built in the Corporation stone-yard at the bottom of North-road, adjoining the North-road Slipper Baths. The building covers an area of 138 ft. by 61 ft., and is approached by a red brick entrance and lobby, in the mosaic flooring of which is worked the borough arms. The water surface of the swimming-bath measures 120 ft. by 30 ft., and the water ranges in depth, by a gradual slope at the bottom of the baths, from 3 ft. 6 in. at the south end to 7 ft. at the north end. The bottom and sides of the bath are paved and lined with white glazed bricks and tiles. The platform around the bath is of mosaic paving. The east and west sides are occupied by 65 dressing boxes. The woodwork is of pitch-pine, and the front of each box is enclosed with a half door and a terra-cotta coloured sliding curtain. The walls of the building are lined with white glazed bricks, carried to a height of 4 ft. 6 in. above the gallery floor, where they terminate with a band of blue bricks. Above this band the walls are finished with white Suffolk bricks, the piers and arches being of red bricks. The galleries, approached by staircases near the entrance, extend round the north, east, and west sides of the building, and are capable of seating upwards of 500 persons. Like that of the dressing-boxes, the wood-work is of pitch-pine, and the front is fitted with an iron-work fencing. The roof is carried upon ornamental iron principals, and lighted by a lantern roof extending along the full length of the building. The artificial lighting is by electricity. The water of the bath is heated by steam on the Rosher system. On the east side of the building are superintendent's office and stores, ladies' room, lavatory, gentlemen's room, and foot and shower-bath. The work has been carried out under the supervision of the Borough Engineer and Surveyor (Mr. F. J. May). Messrs. Longley & Co. were the builders. The skylight over the bath was glazed on Messrs. W. E. Rendle & Co.'s patent "Invincible" system.

PROPOSED NEW POLICE OFFICES AND BOROUGH COURT, HALIFAX.—A report of the Halifax Borough Engineer, Mr. E. R. S. Escott, shows how it is proposed to adapt the Infirmary buildings—the site of which contains an area of 4,300 yards—to the purposes of a police-station and court-house. The plans include the provision of magistrates' public and private rooms, magistrates' clerks' offices, rooms for solicitors and witnesses, chief constable's office and charge rooms, detectives' offices, cells, police parade room and recreation hall, parade yards open and covered, stables, and van shed. It is proposed to utilise the ground and first floors only of the main Infirmary buildings, and not any portion of the Assembly Rooms.

NEW HALL, NEWPORT.—The Tredegar Hall, Newport, was opened on the 14th inst. by the Right Hon. Lord Tredegar. The new building, which is to be used as a concert and assembly-room, was erected from designs and under the superintendence of Messrs. Habershon & Fawckner, architects, of Newport and Cardiff. The hall affords sitting accommodation (inclusive of the orchestra and platform) for 1,350, with standing-room for 400 in addition. In order to get the accommodation required, the architects introduced an upper balcony, with corridor right round the hall. The balcony front was constructed by Messrs. Baker & Co., of the Westgate Iron Works, Newport. The warming is effected by hot water on the low-pressure system. The corridors and main stairs are fireproof throughout. The builders were Mr. George Wilkins and Mr. George Martin.

EXTENSION OF ST. MARGARET'S CONVENT CHAPEL, EDINBURGH.—During the past eighteen months the chapel of St. Margaret's Convent, Whitehouse, Loan, Edinburgh, has been undergoing enlargement, which has just been completed. The result is the addition to the former structure (which consisted of a choir and side aisles) of a new sanctuary or chancel with hexagonal apse, a vaulted crypt chapel beneath, a lady chapel, two sacristies, and a new organ loft. A number of memorial stained-glass windows have been introduced into the enlarged edifice. Occasion has also been taken to erect in the extended church a new altar. The tabernacle, with gilt door jewelled, shows prominently in the centre of the altar table. Both altar and tabernacle are of

white alabaster. The gradus or step on which the tabernacle stands and the super-altar with its cornice are likewise of white alabaster. On the extremities of the super-altar stand small clustered shafts, from which spring cusped arches, joining on the one hand the side wall of the apse, and on the other forming connexion, in the shape of a flying buttress, with the reredos, which is placed against the back wall of the apse. Angels standing erect on the clustered shafts hold in their hands shields bearing the instruments of the Passion. The throne, which forms the central feature of the reredos, rises from the carved figure of an angel. Above this, canopied work with cresting, flanked by buttresses, and rising into spirelet forms and pinnacles, complete the treatment. The throne is flanked on each side by sculptured panels in high relief, the subjects represented being again angels in various adoring attitudes. Canopied work crowns this part of the design also. The whole work has been designed by and carried out under the personal supervision of the architect, Mr. Archibald Macpherson, of Edinburgh. The sculpture work was executed by Mr. William Vickers, Glasgow; whilst the metal work of the tabernacle was executed by Messrs. Hardman, Powell & Co., Birmingham, also from the architect's design.

FOREIGN AND COLONIAL.

FRANCE.—The Council of Directors of the 1900 Exhibition have this week examined and adopted in its main lines the scheme of M. Bouvard for the general arrangement of the Exhibition.——A new Hippodrome is shortly to be constructed in the Boulevard Malesherbes, from the plans of M. Yvon, architect.——The new Sceaux Railway is to be formally opened in April. The work has been carried out throughout under the direction of M. Brosse as engineer.——The following young architects have been selected by the Academie des Beaux-Arts to take part in the Prix de Rome competition; MM. Dusart, Duquesne, Bigot, Murser, Patouillard, Pille, Umdenstock, Auburtin, and Lamaresquier. ——The Municipality of Paris is about to open a competition for the best methods of warming the horticultural establishments which M. Formigé has been commissioned to erect at Boulogne.——The Société Academique d'Architecture of Lyons has chosen for its two competitions in archæology and architecture this year the following subjects:—"The decoration of the Place Bellecour at Lyons," and "The state of the Pont de la Guillotière at Lyons in the reign of Henry IV., from 1600 to 1610."—— The premium in the competition for a monument to President Carnot at Fontainebleau has been awarded to M. Peynot. The design shows the bust of the arms of Fontainebleau; at the foot of the monument is a seated figure representing France, clad in a robe of regretted president, on a stele ornamented with the mourning, and holding a flag. The portrait bust will be in bronze, and the rest of the monument in stone. It will be placed in the place opposite the Marché au blé.——The Commune of Milly, where Lamartine lived for a long time, is about to set up a bronze bust of the poet, in place of the stone one executed twenty years ago by Mdme. Adam Salomon, and which is now in a perishing state.——The government has submitted to the chamber of Deputies a project for opening a canal from Marseilles to the Rhône. The canal, about 54 kilomètres in length, would run along by the coast as far as the point la Lave, piercing the hill range of Rove by a tunnel about 8 kilomètres long, and coming out on the south of the lake of Berre as far as Martigues, and subsequently joining the Rhône. The estimated cost is about eighty million francs. It would give a great extension of commerce to Marseilles.——The death is announced of M. Paul Lenfant, formerly an architect to the City of Paris, and that of M. Maurice Dormoy, President of the Society of Architects of Aube.——The death is also announced of the Sculptor Léon Delhomme, who was a member of the Municipal Council of Paris, and occupied himself much with artistic questions in that assembly. He was a pupil of Dumont, and was the author of the statue of the Republic placed in the new Sorbonne, and of the statue of Louis Blanc in the Place Monge.

MISCELLANEOUS.

THE COMMISSIONERS OF SEWERS.—At the meeting of the Commissioners of Sewers, held at the Guildhall, on Tuesday in last week, the Chairman (Mr. Gordon) called attention to a statement in the recent report by Major Carden on the subject of explosions in the streets, in the district of St. Pancras, caused by electricity. The electrical inspector of the City, being asked whether danger existed from a similar cause in the underground wires of the City, the Inspector (Mr. Voysey) stated that the explosions referred to in the report which had been caused by a deposit of sodium at points where electricity passed through bare metal wires in contact with hardware insulators, had occurred through the leakage of wet coming into contact with the sodium, but such accidents could not occur in the City because they had no bare metal conductors, and no hardware insulators. From the Engineer's report for the past year it appeared that no new sewers had been made during that period, but 387 houses and warehouses had been drained. Thirteen miles of streets were lighted by electricity by means of 483 arc lamps, which had superseded 1,338 gas lamps. In the streets and courts of the square mile on which the City stands, 20,234,217 gallons of water had been used for cleansing purposes and 1,400 loads, on the average, of house and street refuse had been removed every week—of which about one-third had been treated by fire in the destructor at Lett's Wharf, which had been at work day and night throughout the year, except during a few days when it was stopped for repairs. The report stated that a day census taken by the Corporation showed that 1,186,000 people daily entered the City, either on foot or in carriages, and that 92,000 vehicles entered and left the City on the same day—a volume of traffic not equalled, or even approached in any other city in the world.

LECTURES ON SANITATION IN NORFOLK.—The Sanitary Institute, in conjunction with the County Council of Norfolk and the Technical Education Committee, Norwich, have arranged a course of twelve lectures and demonstrations for sanitary officers and others in Norfolk. The lectures have been arranged for the special instruction of those desirous of obtaining knowledge of the duties of sanitary officers, but will be open to all who wish to attend. The Norfolk County Council will pay half the train fares and half the examination fees of all selected candidates in the administrative County of Norfolk. The grant towards train fares and examination fees will be paid at the end of the course to those only who have attended two-thirds of the lectures and who sit for the examination for inspectors of nuisances, and they will pay full fares and fees of all who pass. The Council of the Sanitary Institute will arrange to hold an examination for Inspectors of Nuisances in Norwich on July 15 and 16. The lectures, which will be given in the Technical School, Norwich, at two o'clock on Saturdays, will commence on the 30th inst., and will conclude on June 29.

PRESENTATIONS TO A SURVEYOR.—Mr. Baker, C.E., has just been appointed Borough Surveyor for Middlesbrough. At the last meeting of the Canterbury Corporation, the resignation of Mr. Baker as Borough Engineer, was accepted with expressions of regret, and the Corporation decided to mark their appreciation of his services by presenting him with an illuminated address and a cheque for 100 guineas. Subsequent to the meeting of the Corporation a gathering of the officials and citizens of Canterbury was held, at which Mr. Baker was presented with a gold watch and a purse of gold, subscribed for by the citizens and officials, on the initiative of the members of the Chamber of Trade.

THE WATER COMPANIES AND FROZEN MAINS.—The attention of the Grand Junction Waterworks Company having been called to the fact that many of their mains are frozen, Mr. A. Fraser, the engineer to the Company, has written that before next winter the Company's pipes shall be lowered to a proper depth, if they are not sufficiently low now. It is, he remarks, very difficult to say what is the proper depth to lay pipes, as the frost appears to have penetrated to a greater depth in some places than in others. A depth of 2 ft. 6 in. from the top of the pipe should, he adds, be sufficient, and the Company will take care to have this put right before next winter.

THE SANITARY INSTITUTE.—At an examination for Inspectors of Nuisances, held at Newcastle-on-Tyne on Friday and Saturday, March 15 and 16, the following candidates were certified, as regards their sanitary knowledge, competent to discharge the duties of Inspectors of Nuisances:—F. Barrett, Keighley; T. B. Burrell, Seaham Harbour; N. Coates, New Brighton, Cheshire; G. Cocks, Blyth; W. Davison, Corbridge-on-Tyne; W. Douglas, Glanton R. S. O., Northumberland; J. G. Forsythe, Sunderland; J. Kilner, Penrith; J. R. MacMillen, Earsdon; R. T. W. Morrison, Newcastle; J. Porter, Perth; W. Ramscar, Stockport; J. W. Scott, Workington; J. Sheraton, Seaham Harbour; W. Wood, Hull.

ENGINEERING APPOINTMENT.—Mr. Charles J. Jenkin, Assoc.M.Inst.C.E., A.M.I.Mech.E., has been appointed Resident Engineer on the Llandudno (N. Wales) Sewerage Extension Works, under the direction of Mr. E. Paley Stephenson, Engineer to the Urban District Council.

MORE ROMAN REMAINS AT BATH.—At the meeting of the Baths Committee at Bath on the 15th inst., considerable discussion took place respecting the excavations which have been for some time proceeding adjacent to the pump-room. In a Roman duct, which has been in process of excavation, have recently been found a number of gems and stones, engraved and partially engraved. The surveyor of works was of opinion that the presence of these stones in this condition showed that some of the smaller rooms of the old baths were used as shops, one of them being that of a lapidary. He also reported the discovery of a very massive stone drain crossing the duct, some of the stones being 7 ft. long. Further, in another part of the works, beneath the pump-room itself, he had found pillars. It was resolved that the surveyor of works should prepare a special report for presentation to the council, who should be asked to vote a sum for continuing the explorations in that direction.

SANITARY INSPECTORS' ASSOCIATION.—A deputation from the Council of the Sanitary Inspectors' Association waited on Sir Walter Foster, M.P., at the offices of the Local Government Board, on the 15th inst., for the purpose of bringing to his notice the insecurity of the tenure of the office of sanitary inspectors as set forth in the annual appointments sanctioned by the Board, and also the meagreness of the inspectors' salaries. The deputation included, besides a large number of Metropolitan members of the Association, delegates from Derby, Wigan, Burton-on-Trent, Maidstone, and other provincial towns. Sir B. W. Richardson, President of the Association, who introduced the deputation, said the necessity for a decision on the points named was raised by the manner in which a Mr. Watson, of Burton-upon-Trent, had been treated by his Board. The district had been on more than one occasion revised and the salary reduced, until now Mr. Watson had been thrown out altogether. This was only one of several instances which were almost as bad. He admitted that the Local Government Board had no direct power, but it had a great deal of negative power, and what they wanted was a direct change by which a certain tenure of office should be given to all sanitary officers. They ventured to suggest that tenure of office should depend on the Local Government Board; that the minimum salary should not be less that 200*l* a year, with a maximum of 350*l*, and a small retiring pension.—Other speakers having been heard, Sir Walter Foster, in the course of his reply, said that, now that the local government of the country was more or less settled, the Board would use its influence with local authorities to do away with appointments for short periods, and to encourage the appointment for a term of years or permanently. They were prepared to go so far without any Act of Parliment. In reference to salaries, he found they were not as a body paid properly, and in those cases which came before their notice they had discouraged small and inadequate salaries. As to pensions, that must be a thing they must work out for themselves. He acknowledged that the case of Mr. Watson, to which reference had been made, was a hard one; but it was one of those in which the Local Government Board had no real authority.—The deputation then withdrew.

ENGLISH GOTHIC ARCHITECTURE.—Mr. W. J. Anderson, A.R.I.B.A., delivered a special lecture in the School of Art, Glasgow, on the 14th inst., on English Gothic architecture, with particular reference to the cathedrals. The Early English period was divided into lancet and geometric, and the term curvilinear preferred to Decorated, as these forms in the window tracery were in England an almost unfailing mark of the date of the building. In French Gothic the constant aim of the designer was to produce overpowering effect of internal height, the vaulted roofs demanding for their support a great scaffolding of superimposed flying buttresses as at Beauvais and Bourges, which externally destroyed all sense of repose. If this was to be defended and praised in the prevailing fashion as the only true Gothic and the logical outcome of the Gothic idea, we were forced to believe that the Gothic idea carried to its conclusion was opposed to sound constructive science and to æsthetic effect. But the English mind of the thirteenth century aimed at an impression of great internal length and moderate height of avenues, which served their chief purpose best, and at the same time had the happiest effect externally, enabling them to rear such a central tower as would be the glory of the whole fabric. The great length gave repose externally, and the bold transept projection aided materially to produce a picturesque effect from any point of view. The group of central and western towers generally designed for English cathedrals, and carried out at Carlisle, Lichfield, York, and Lincoln, was the finest that could be imagined, and there was no possible vantage ground which would give a disappointing view of such buildings. The aspidal termination of the interior of the French churches was magnificent, but was almost compensated for by the splendid eastern window of the English, at Carlisle and Lincoln, for example, and the good appearance of the square end externally. The greater number of the English cathedrals was shown by lantern views, externally and internally and in detail, and a short series of views of Scottish architecture followed. The lecturer contended that in the main Scottish Gothic architecture does not differ materially from English work, and was less influenced by French Gothic than had been popularly supposed. Scotland was strong in Transitional work, which often took the form of the pointed arch with Norman mouldings and the French square abacus and capital, as if the form of the pointed arch had travelled northward more swiftly than the appropriate details of the Gothic style. This it was which gave it the resemblance to French Gothic, as at Jedburgh Nave, and this, it was suggested, had misled critics. In the chief distinctive features of the French style—excessive height, absence of central tower, general use of the apsidal termination, the square arch order, the central buttresses and chapels, and the rose windows—Scotland had no

part with France, and the marks of French influence were not nearly so apparent as of English.

THE OLD EDINBURGH SCHOOL OF ART.—The sixth of the series of lectures being given under the auspices of the old Edinburgh School of Art was delivered in the Free Assembly Hall on the 16th inst. by Mr. S. Henbest Capper, A.R.I.B.A., on "St. Giles'." Mr. Capper at the outset said it was remarkable that they did not know in what state the great cathedrals of Scotland were just before and just after the Reformation. It was, however, perfectly clear that all the internal decorations of the great churches, the carved stalls, the vestments and church vessels, the manuscripts of the church libraries, and the monuments of the dead were all irremediably destroyed. It was an amazing fact that the only existing unmutilated effigy of a Scottish king or queen was that of Mary Stuart in Westminster Abbey. Taking up the history of St. Giles', perhaps the most important of the lesser churches that survived the upheaval of the Reformation, the lecturer in a series of illustrations pointed out the parts of the existing building which were anterior to the disastrous invasion of Richard II. in 1385, the enlargements undertaken immediately thereafter, the Albany Aisle and other additions of the first year of the fourteenth century, and finally the Preston Aisle and reconstruction of the choir about 1460, when the parish church was converted into a collegiate establishment. The subsequent events of the church's history, its connexion with John Knox and Queen Mary, and the riot of 1637, were briefly touched upon.

WATERWORKS, LEEDS.—At a meeting of the Leeds Waterworks Committee, on the 8th inst., Alderman Cooke presiding, a report was submitted from Mr. Hill, C.E., on the work of the reconstruction of the Eccup reservoir. Mr. Hill had examined the bottom of the trench, and approved of the work done. He agreed with the City Engineer (Mr. Hewson) that the re-puddling of the deepened portion of the trench might now be safely commenced. Brick side screen walls, he thinks, should be built on the reservoir side of the trench to protect the puddle. The total depth of the trench from the finished road level to the bottom is 170 ft., the length along the bottom 420 ft., greatest width at the top 26 ft., and average depth of shale taken out below the bottom of the old trench 39 ft.

LEGAL.

BUILDING ON CHURCH SITES IN THE METROPOLIS:

IMPORTANT CASE IN CHANCERY DIVISION.

ON the 14th inst., Mr. Justice North, in the Chancery Division, had before him a summons taken out under the Vendor and Purchasers' Act, 1874, in the matter of a contract between the Ecclesiastical Commissioners and the New City of London Brewery Company, Limited, which raised the question whether the Commissioners could give a good title to the site of a church for building purposes, under the Union of Benefices Act, 1860, or whether the effect of the Disused Burial Grounds Act, 1884, as affected by other Acts, was to prohibit building on such sites. It appeared that the New City of London Brewery Company contracted to buy the site of the church of All Hallows the Great, Upper Thames-street, from the Commissioners for the purpose of making additions to their brewery, but on investigating the title the company took the objection that the site of the church appeared to be a disused burying-ground within the meaning of the Disused Burial Grounds Act, 1884, and Section 4 of the Open Spaces Act, 1887, and as such was prohibited from being built upon. There was no dispute but that the sale was the sale of a building site, and that if building was prohibited on it the sale must fall. It was also beyond dispute that interments had taken place in the church itself. The principal question, therefore, was whether the church could be said, because interments had taken place within it, to have been set apart at any time for the purposes of interments.

Mr. Samuel Hall, Q.C., and Mr. W. B. Heath appeared as counsel for the New City of London Brewery Company (the purchasers); and Mr. Swinfen Eady, Q.C., and Mr. Blakesley for the Ecclesiastical Commissioners (the vendors).

At the conclusion of the arguments of counsel, his lordship, in giving judgment, pointed out that the Union of Contiguous Benefices Act, 1860, although general in its title, was confined to the metropolis. Section 17 of the Act drew marked distinctions between the site of a church, and churchyards and burial grounds, providing carefully for the reverential removal of human remains interred under any church itself, and also expressly enacting that burial-grounds and churchyards should not be sold. Section 22 of the Act referred to the application of the purchase-money of the site of any church, sold under the Act, in a way that contemplated in his opinion that such purchase-money could only arise from the sale of the site as a building site. In his opinion, independently of subsequent legislation, it was clear that under the Act of 1860, the Commissioners could have sold the site to a purchaser who could build upon it. In over-ruling the argument that had been urged on the construction of Section 4 of the Union of Benefices Act Amendment Act, his Lordship remarked that that Act recited certain older Acts, but did not refer to the Metropolitan Act of 1860, and gave powers to the bishop, with the consent of the incumbent by faculty, without the necessity of the consent of the several high authorities who had to be applied to under the Act of 1860. He considered that the construction he put upon the Act had been adopted by the Court of Appeal in the case of the Ecclesiastical Commissioners *v.* Kino, a case where it was held that the Commissioners were entitled to restrain building so as to interfere with access of light to the space that had been occupied by ancient church windows. He came to the conclusion that the site of a church, where interments had actally taken place, could, in no sense, from that fact merely, be said to have been set apart for the purpose of interments, and that the first effect of the Acts, relied upon by the purchasers, was not to interfere with their right as purchasers from the Ecclesiastical Commissioners to build on the site of the church. He, therefore, gave judgment in favour of the Ecclesiastical Commissioners.

THE LAW COURTS AND THE CONTRACTORS.

ON Monday last in the Court of Appeal, consisting of the Master of the Rolls and Lords Justices Lopes and Rigby, Mr. Danckwerts moved, *ex parte*, in the matter of an arbitration between Messrs. Bull & Sons and Her Majesty's Commissioners of Public Works and Buildings, on behalf of the Commissioners for leave to appeal from an order made by Mr. Baron Pollock in Chambers, extending the time for making an award until the 31st of the present month, the time having expired on December 31st last. The learned counsel stated that the arbitration had reference to disputes which arose in June, 1883, about the Law Courts. The submission was dated in June, 1883, but there had been numerous extensions of time, and practically nothing had been done in the arbitration, as there had been only a few formal sittings. Although Messrs. Bull & Sons had delivered some particulars, they had not yet delivered full particulars of their claim. The present extension of time was granted to enable their creditors to see whether they would finance them, and if so, it was understood they would apply for a further extension. The Commissioners had already expended a large sum of money in the matter, and the arbitration had been delayed so long that they were anxious to take the opinion of the Court as to whether any further extension of time should be granted.

In the result their Lordships refused to give leave to appeal.

ACTION FOR OBSTRUCTION OF LIGHT: HARRIS *v.* KINLOCH & CO.

THE case of Harris *v.* Kinloch & Co., Lim., came on for hearing in the Chancery Division before Mr. Justice Kekewich on Tuesday, it being an action brought by the plaintiff, Mr. John Harris, the owner in fee simple of a building known as No. 36½, Gower's Walk, in the City of London, against the defendants, for an injunction to restrain them from erecting on the south and east of the plaintiff's property any building in such a way as to interfere with or obstruct the access of light to his skylights. There was also a claim for 500*l.* damages. The plaintiff's case was that the defendants, who were the owners of property adjoining his on the south side, had recently pulled down buildings which abutted on his building on the south, and intended to build on the site of the old building warehouses, which would be from 30 ft. to 50 ft. higher than the old building, and for that purpose the plaintiff alleged the defendants intended to raise the wall on the south of his building from 30 ft. to 35 ft. beyond its former height. The plaintiff also alleged that the defendants intended to extend the south wall at the same height towards the east. His Lordship, after hearing evidence and the arguments of counsel, granted the injunction asked for as regarded the south wall, assessing the damages at 25*l.*, the defendants to pay the costs of the action, except so far as they had been increased by the plaintiff seeking to recover damages for an alleged trespass, those excepted costs being paid by the plaintiff or set-off against the others.

Mr. Warmington, Q.C., and Mr. Curley appeared as counsel for the plaintiff, and Mr. Renshaw, Q.C. and Mr. Theobald for the defendants.

CASE UNDER THE 1855 METROPOLITAN BUILDINGS ACT:

LONDON COUNTY COUNCIL *v.* J. GROVER.

AT the Marlborough-street Police Court, on the 19th inst., Mr. John Grover, a builder, of the firm of J. Grover & Son, Wilton Works, New North-road, appeared in answer to an adjourned summons under the Metropolitan Buildings Act of 1855 for making openings in the upper part of the east party-wall, contrary to Section 13 of the Act, while erecting a building at the corner of Harewood-place, Oxford-street. Where part of the premises complained of stood there formerly existed stables two stories high. In the wall carried to this height there were apertures in which windows had been placed. The question was whether the wall which had been built up was a party-wall within the meaning of the Act. It was held by the prosecution that it was a party-wall, and, therefore, objection was taken to certain of the apertures which had beeen made in it for the windows. In support of this proposition Mr. Avory, who prosecuted for the County Council, quoted several judgments which had been given in the higher Courts, and specially referred to the case of "Williams *v.* Ball," in February, 1890. Mr. Dickens contended that, within the meaning of the Act, the wall would not be called a party wall, and that, as a matter of fact, it stood within land absolutely belonging to the defendant. Evidence was given showing that the new windows had been opened with the consent of the owner of the property adjoining. Mr. Hannay, in giving his decision, said the question was whether a wall which was, in fact, an external wall where the windows were placed in it, although a party wall lower down, must be held to be a party wall above the point where it ceased to separate two buildings. He came to the conclusion that there was nothing in any part of the Act to support the complainants' contention, while there were some things which, to say the least of it, favoured the defendant. What authority there was was also in his favour. The wall in dispute being, where the windows were placed, an external wall in fact, there was nothing in the Building Act, or in any reported decision, to make it a party wall in law. He would not touch upon the point that this wall was built upon the defendant's land, as it was use, not ownership, that determined its character. Nor had he noticed a circumstance upon which Mr. Avory seemed to lay some stress—that the wall had been carried up for the regulation distance of a party-wall above the roof of the new building. That could not make it a party-wall, whatever the architect might have thought; and it was clearly impossible to leave it without some sort of finish.—The summons would be dismissed.—Mr. Dickens asked for costs, and Mr. Hannay allowed 10*l.* 10s.

CAPITAL AND LABOUR.

THE SITUATION IN THE LONDON BUILDING TRADE.—An adjourned conference between the representatives of the Central Association of Master Builders of London and delegates from the various trades was held on Tuesday, but was dissolved, as the delegates still persisted in their opposition to the suggested amendments, and especially with regard to the clause—"That no workman shall be placed under any disability by reason of being or not being a member of a trade society."

STATE OF EMPLOYMENT IN FEBRUARY.—The month of February (says the *Labour Gazette*) has been abnormal as regards employment in out-door trades. Owing to the frost, which lasted through the greater part of the month, many branches of out-door labour were almost at a standstill, the result being a considerable increase in the number of the unemployed, and of applicants for poor-relief. Towards the close of the month matters improved, but at the end the percentage of unemployed in unions connected with the Building Trades was more than twice as great as at the corresponding time last year. In the Building Trades the percentage of unemployed in unions making returns has increased from 8·2 to 10·1, compared with 5·0 per cent. in February, 1894. The plumbers, however, have been well employed at the end of the month. Five disputes occurred in the Building Trades, of which two were on questions of wages and three on questions of working arrangements.

MEETINGS.

FRIDAY, MARCH 22.

Sanitary Institute (*Lectures for Sanitary Officers*).—Dr. Louis Parkes on "Water-Supply, Drinking Water, Pollution of Water." 8 p.m.

Institution of Civil Engineers (*Students' Meeting*).—Mr. G. B. Williams on "Pipe-Siphons under the Ouse, at York." 8 p.m.

SATURDAY, MARCH 23.

Sanitary Institute (*Lectures and Demonstrations for Sanitary Officers*).—Inspection and Demonstration of Beddington Sewage Farm, Croydon.

Queen's College, Cork.—Mr. Arthur Hill on "The History of Architecture." XVI. 3 p.m.

SUNDAY, MARCH 24.

South Place Institute.—Mr. C. Hill on "Plumbing: Past and Present." 4 p.m.

MONDAY, MARCH 25.

Royal Institute of British Architects.—Mr. H. W. Burrows on "Sound in its Relation to Buildings." 8 p.m.

TUESDAY, MARCH 26.

Institution of Civil Engineers.—Discussion on Mr. H. Davey's paper on "Steam-Engine Economy: Condensing Engines." 8 p.m.

Royal Victoria Hall, Waterloo Bridge-road.—Professor Seaman on "Modern Athens." 8 p.m.

Sanitary Institute (*Lectures and Demonstrations for Sanitary Officers*).—Dr. E. C. Seaton on "Infectious Diseases and Methods of Disinfection." 8 p.m.

Builders' Clerks' Benevolent Institution.—Adjourned General Meeting of Donors and Subscribers. 7.30 p.m.

WEDNESDAY, MARCH 27.

Carpenters' Company (*Free Lectures on Matters Connected with Building*).—Sir E. Leader Williams on "The Works of the Manchester Ship Canal." 8 p.m.

COMPETITIONS, CONTRACTS, AND PUBLIC APPOINTMENTS.

COMPETITIONS.

Nature of Work.	By whom Advertised.	Premiums.	Designs to be delivered.
*School Buildings	Abergavenny Intermediate School Mngrs	.....	April 11
*Sewerage Scheme	Brigg U.D.C.	.....	April 19
*Shops, Offices, Two Hotels, &c. Preston	N. Miller	150*l.* 100*l.* and 50*l.*	May 27
*School, Whitwell	.....	.....	No date

CONTRACTS.

Nature of Work or Materials.	By whom Required.	Architect, Surveyor, or Engineer.	Tenders to be delivered.
*Cleaning, &c. S.W. Hospital	Met. Asylums Board	T. W. Aldwinckle	Mar. 25
Villa Residence, Morley, Yorks	H. A. Bradley	T. A. Buttery	Mar. 26
Electric Lighting Station, West Holborn	South Shields Corp.	F. Rennoldson	do.
Sewerage Works, near Guisborough	Skelton and Brotton U.D.C.	D. Balfour	do.
Mortuary	Handsworth Urban Sanitary D.C.	E. Kenworthy	do.
Main Sewers, Sewage Carriers, &c.	Keighley R.D.C.	Barber, Hopkins, & Co.	do.
Excavating and Forming Roads, Public Park	Cockermouth U.C.	M. Marsh	do.
Earthenware Conduit	Gorton (Lancs.) U.D.C.	C. J. Lomax	do.
*Construction of Pipe Sewers, &c.	Willesden Dist. Coun.	O. Claude Robson	do.
*Paving Works	Tottenham U.D.C.	P. E. Murphy	do.
Retaining Wall, Deepdale, Hardwick-road	Wellingborough U.D.C.	*Official*	do.
*Road Materials	Bromley U.D.C.	do.	do.
*Paving Works	Lewisham Bd. of Wks.	do.	do.
Haslingden Setts and Flags	Rochdale Corporation	do.	Mar. 27
Alterations, &c. to Workhouse	Barnet Union	do.	do.
Gasholder	Heywood (Lancs.) Corp.	J. Diggle	do.
Pipes and Laying, Hydrants, &c.	Selby U.D.C.	W. Curry	do.
Water Mains (6 miles), near Wigan	Haigh R.D.C.	Heaton & Ralph	do.
Kentish Rag, Ightham Stone, &c.	Malling (Kent) R.D.C.	J. Ennals	do.
Welsh Road Stone and Setts, Facit, Lancs.	Whitworth U.D.C.	M. Rodley	do.
Pipe Sewers (1,472 yards)	Selby U.D.C.	W. Curry	do.
Pavilion, Meyrick Park	Bournemouth T.C.	F. W. Lacey	Mar. 28
Macadam, Kerbing, &c.	Gateshead Corp.	J. Bower	do.
Sewering and Tiling Footpaths, Grey-street	Workington Sanitary Authority	W. L. Eaglesfield	do.
*Stone, Ballast, and Sand	St. George's-in-the-East Vestry	*Official*	do.
*Road and Sewer Works	St. John's (Hampstead) Vestry	do.	do.
*Sewerage, &c. Works	Godstone R.D.C.	do.	do.
Offices	Grimsby Waterworks Co.	do.	do.
Earthenware Pipe Sewer, Darfield, Yorks.	Barnsley R.D.C.	do.	do.
Street Works, Paving, &c.	Jarrow Sanitary Auth.	do.	do.
*Timber-Framed Firing Battery, &c. &c. Buddon, Forfarshire	Admiralty	do.	Mar. 29
Earthenware Pipe Sewer, &c.	Skipton R.D.C.	Barber, Hopkins, & Co.	do.
Kerbs, Channelling, &c.	Clayton-le-Moors U.D.C	A. Dudgeon	do.
Pumping Station (two contracts)	Hull Corporation	A. E. White	do.
*Wesleyan Chapel, Pontypridd	.....	A. O. Evans	Mar. 30
Pier, Bayble, near Stornoway, N.B.	Ross & Cromarty C.C.	J. Fraser	do.
Police Station, Ashington	Northumberland C.C.	J. Cresswell	do.
Additions to Offices	Elland U.D.C.	Horsfall & Williams	do.
Schools, near Southampton	Bishopstoke Sch. Bd.	Cancellor & Hill	do.
Drainage Works	Chapel-en-le-Frith R.D.C.	Stirling & Swann	do.
Rowley Ragstone, Kerbs, and Setts	Smethwick U.D.C.	J. C. Stuart	do.
Road Materials, Hereford	Ross R.D.C.	G. Haines	do.
*Concrete and Brick Foundations	Sheffield United Gas Light Co.	F. W. Stevenson	do.
Alterations, &c. to The Cedars, Cross, near Axbridge	.....	S. J. Wilde	do.
Stabling, Shed, &c. White Horse Inn, Lightcliffe, near Halifax	.....	J. Drake	do.
Parish Room and Offices	Pennington Parish C.	*Official*	do.
Surveyors' Materials, Sandwich, Kent	Eastry High Authority	do.	do.

CONTRACTS—*Continued.*

Nature of Work or Materials.	By whom Required.	Architect, Surveyor, or Engineer.	Tenders to be delivered.
Granite Road Metal	King's Lynn Corp.	E. J. Silcock	Mar. 31
Surveyors' Materials, Peterborough	Norman Cross 'Highways' Board	J. Hughes	April 1
*Brick Main Sewer, &c.	Hastings Corp.	P. H. Palmer	do.
*Sewerage Works, Clive Valley District	do.	do.	do.
Science and Art Schools, Otley, Yorks.	do.	Alfred Marshall	do.
*Pulling Down Premises	Rotherhithe Vestry	*Official*	do.
Repairs to Bridges and Roads, Exeter	Devon C.C.	do.	April 2
*Grain Warehouse, Plymouth	Gt. Western Ry.	do.	do.
Grain Warehouse, Millbay, Mileage-yard, Plymouth	G. W. Ry. Co.	do.	do.
*Portland Cement and Stoneware Pipes	East Ham U.D.C.	do.	do.
School Chapel, Sedbergh, Lancaster	.....	Paley, Austin, & Paley	do.
Cast-Iron Pipe Sewers and Purification Works, Tibshelf	Blackwell R.D.C.	H. Walker	April 3
Five Houses, Queen's-road, Halifax	.....	Medley Hall	do.
Road Works, Whitehill and Lochmoddie	Ayr C.C.	D. M. Ross	April 4
Presbyterian Church, Sandes-avenue, Kendal	.....	S. Shaw	do.
*Construction of Sub-Station	St. Pancras Vestry	Prof. H. Robinson	do.
*Reconstruction of Offices, &c.	Cardiff Gas Light and Coke Co.	H. Morley	April 5
Laying Water Mains, &c. Coppull	Chorley R.D.C.	Jolly & Buckley	do.
Granite Road Metal, Aylesbury	Bucks C.C.	R. J. Thomas	April 6
*Well Sinking, &c.	Suffolk County Asylum	G. & F. W. Hodson	do.
*Erection of Bridge, &c.	Berkshire C.C.	*Official*	do.
Granite and Slag	Long Sutton U.D.C.	do.	April 8
Vagrant Wards at Workhouse, Grenoside, Sheffield	Wortley Union	G. A. Wilde	April 9
*Blue Bricks	Edmonton U.D.C.	G. E. Eachus	do.
Main Conduit (11 miles)	Belfast Water Com.	M. Macassey	April 11
*Casual Wards, Board, &c. Rooms, &c.	Braintree Union	*Official*	April 18
*Machinery, &c.	Borough of West Ham	Lewis Angell	May 14
*Completion of Fourteen Houses, Brixton	.....	H. J. Wise	No date
Chapel and School, Overseal, near Church Gresley, Notts.	Rev. E. Ball	H. Harper	do.
Additions to Schools at the Common	Normanton School	W. Watson	do.
Stores and Brewery Extensions, Crawshay-street, Cardiff	W. Hancock & Co. Ltd.	Jones, Richards, & Budgen	do.
Sewers, and Making-up Seven Roads, Grange Estate	Birmingham Freehold Land Soc.	T. S. Fallows	do.
*Hot-water Supply, Workhouse, Mildenhall	.....	F. Whitmore	do.
Pair Semi-detached Houses, Springfield-avenue, Ripon-road, Harrogate	J. J. Kayall	H. E. & A. Bown	do.
*Laundry Buildings, Canterbury	.....	W. J. Jennings	do.
House and Shop, Union-street, Aberdeen	.....	Matthews & Mackenzie	do.
Shop and Residence, Buttevant, near Cork	.....	T. W. Linnatran	do.
Large Factory, Hinckley	.....	Redfern & Haigh	do.
Additions to Lake Hotel, Killarney, Ireland	.....	Loyd, Knox, & Grimshaw	do.
High Chimney, Laurel Works, Bervie, near Montrose, N.B.	.....	J. Sim	do.
Mansion, near Southwell, Notts.	.....	J. P. Earle	do.
*Alterations to Premises	.....	.....	do.

PUBLIC APPOINTMENTS.

Nature of Appointment.	By whom Advertised.	Salary.	Applications to be in.
*Highway and Sanitary Surveyor	Orsett R.D.C.	150*l.*	Mar. 25
Surveyor, &c.	Hayward's Heath U.D.C.	.....	Mar. 26
Highway Surveyor, Holbeach	East Elloe R.D.C.	125*l.*	do.
*Highway Surveyor	Saffron Walden R.D.C.	150*l.*	Mar. 27
Highway Surveyor	Smallburgh (Norfolk) R.D.C.	125*l.*	Mar. 30
*Clerk of Works	Bacup Corp.	2*l.* 10*s.*	do.
*Surveyor	Malvern U.D.C.	250*l.*	April 4

Those marked with an asterisk (*) are advertised in this Number. ***Competitions, p.*** **iv.** ***Contracts, pp.*** **iv., vi., viii., *and* xxi.** ***Public Appointments, pp.*** **xviii. *and* xix.**

Society of Arts.—Mr. Horace Wilmer on "Modern Photogravure Methods." 8 p.m.

Institution of Civil Engineers.—Students' visit to the Locomotive Works of the London and South-Western Railway at Nine Elms. 2.30 p.m.

Sanitary Institute (Lectures and Demonstrations for Sanitary Officers).—Inspection and demonstration in the Parish of St. George's, Hanover-square. 2 p.m.

Builders' Foremen and Clerks of Works' Institution.—Quarterly meeting of the Directors. 8 p.m.

THURSDAY, MARCH 28.

Society for the Encouragement of the Fine Arts.—Mr. P. H. Newman on "Continental Monumental Brasses." 8 p.m.

Society of Antiquaries.—8.30 p.m.

Civil and Mechanical Engineers' Society.—Mr. A. A. Myall on "Wire-Net Making." 7 p.m.

Institution of Electrical Engineers.—Mr. W. E. Langdon on "The Employment of the Electric Light for Railway Purposes." 8 p.m.

FRIDAY, MARCH 29.

Architectural Association.—(1) Mr. H. Holloway on "Specifications from a Builder's Point of View." (2) Mr. E. C. Pinks on "Specifications from an Architect's Point of View." 7.30 p.m.

Sanitary Institute (Lectures and Demonstrations for Sanitary Officers).—Mr. H. Law on "Principles of Calculating Areas, Cubic Space, &c.; Interpretation of Plans and Sections to Scale." 8 p.m.

SATURDAY, MARCH 30.

Architectural Association.—Visit to St. Peter's Church, Mount Park-road, Ealing. 3 p.m.

Sanitary Institute (Lectures and Demonstrations for Sanitary Officers).—Inspection and Demonstration of Harrison & Barber's Knacker Yard, Whitechapel.

Edinburgh Architectural Association.—Visit to (1) Dalmeny House, (2) The Carmelite Priory Church, South Queensferry, (3) Dalmeny Church.

Queen's College, Cork.—Mr. Arthur Hill on "The History of Architecture." XVII. 3 p.m.

RECENT PATENTS:

ABSTRACTS OF SPECIFICATIONS.

6,662.—BUILDING-BLOCKS: *W. F. F. Bevis.*—This is an arrangement where blocks of an L-shape are used, having insertion or tie-blocks of a plain rectangular shape, the functions of the latter being to bind the wall together and to regulate the distance apart of the blocks.

6,807.—KILNS: *J. Railton.*—This deals with the encasing of brick or other kilns used in the manufacture of pottery or limeburning with metal plates. The principal object is to provide a chamber which shall have absolute freedom from interstices arising from contraction and expansion during working.

7,030.—DRAIN-STOPPERS: *F. A. Barth.*—Consists of a hollow indiarubber cushion placed between two metal discs, one disc having an aperture with a nozzle through which air can be forced for the purpose of extending the rubber cushion.

21,380.—WINDOW FASTENER: *F. C. B. Robinson.*—For preventing vibration, and to exclude draught, a small rod, with a screwed end, fitting through a metal plate on one sash is connected by a small hook on the other sash. On turning the thumbscrew attached to the rod the sashes are drawn tightly together.

24,648.—ROOFING TILES: *H. Hoopman.*—Refers to cement roofing tiles, which are provided with sharp-edged rebates, to make a tight joint one to the other An arrangement for making the tiles is included in the specification.

25,065.—ROOFING TILES: *C. Wicke.*—To prevent water from passing through the roof the tiles are made rhomboidal in form, and have on their upper side an undercut run on one half. An angular recess runs along the rim, and vanishes in the upper face of the tile. This is for catching any water that may be pressed out by the wind.

NEW APPLICATIONS FOR LETTERS PATENT.

MARCH 4.—4,544. J. Hammond, Ball bearing Drill-brace.—4,549, J. Shanks, jun., Water-closets.—4,563, T. Ellis and D. Kingshott, Paint, Varnish, and other similar Brushes.—4,568, J. Anthon, Mortising-machine.—4,580, J. Kingdon, Water Supply Pipes, and protecting same from the effects of Frost.

MARCH 5.—4,647, L. Cresswell, Domestic and other Fireplaces.—4,651, R. Horsfall, Chimney-pots.—4,653, S. Bartlett, Raising and Lowering of Window-sashes.

MARCH 6.—4,711, F. Perkins, Hand-planes.—4,721, W. Simpson, Securing the Handles of Painting-brushes.—4,732, J. Pearson, Blue Bricks, &c.—4,738, A. Murray, Sash-fastener and Lock.—4,772, J. Hamilton, Water-closets.—4,781, J. Welby, Window-sashes.

MARCH 7.—4,820, T. Fawcett, Brick-making Machinery.—4,825, G. Hazlehurst, Thawing Frozen Water-pipes.—4,840, J. Lanyon, Water-closets.—4,843, T. Smith, Hinges.—4,855, E. Jones, Kilns.

MARCH 8.—4,931, J. Bruce, Self-closing Gates and Doors.—4,941, R. Dale, Pushes for Electric Bells.—4,964, A. Brown and others, Water-waste Preventers.—4,973, L. Jones, Fireclay.—4,993, S. Ferry, Domestic and other Fire-grates.

MARCH 9.—5,008, T. Hill, Decorating Tiles, &c.—5,025, C. Seidel, Bakers' Ovens.—5,054, T. Claughton and others, Water-closets.—5,065, A. Foster, Door Locks and Latches.

PROVISIONAL SPECIFICATIONS ACCEPTED.

2,244, W. Wall, Sewer Ventilators.—2,253, J. Whiteside, Pipe Soldering Cramp.—2,283, O. Ellis and others, Tiling of Roofs, &c.—2,499, E. Hughes and L. Campbell, Screw Safety Lift for Buildings and Cliffs.—2,600, F. Hughes and J. Webb, Automatic Door Stop and Holdfast Lock.—2,865, J. Shanks, junior, Discharge Apparatus of Water-closet or other Cisterns.—2,942, G. Gerrey and others, Window-sashes and Window Frames and Fittings.—3,192, F. Cooke, Disinfecting Water-closets, Drains, &c.—3,375, W. Whitley, Machine for Planing, Cutting, or Shaping Strips of Wood.—3,430, R. Lanham, Window-sashes.—3,495, H. Silvester, Stairtreads, Floors, and Similar Surfaces.—3,520, A. Wilesmith, Stoneware Drain-pipes or other Analogous Apparatus.—3,611, C. Bastand, Window-sashes.—3,744, S. Ingram and others, Wood-working Machinery.—3,747, V. Bronius, Planing and Moulding Wood.—3,759, E. and C. Kerry, Shaping Bricks for Gauged and Moulded Brickwork, and also for Shaping Stone.—3,774, E. Collier, Securing Door-knobs on their Spindles.

COMPLETE SPECIFICATIONS ACCEPTED.

(Open to Opposition for Two Months.)

4,815, G. Lavington and E. Wright, Chimney-pots and Ventilating Caps.—6,825, J. Jones, Manhole Covers for Drains, &c.—7,547, W. Quelch, Sash Windows.—8,335, C. and J. Batcock, Straightening and Setting Teeth of Saws.—24,642, W. Waldron, Wall-paper Printing Machines.

SOME RECENT SALES OF PROPERTY:

ESTATE EXCHANGE REPORT.

MARCH 4.—By *Towers, Ellis, & Co.:* 1, St. Stephen's-rd., Bayswater, u.t. 61 yrs., g.r. 10*l.*, r. 80*l.*, 855*l.*—By *Robson & Perrin:* 32, 34, and 36, Sandbrook-rd., Stoke

Newington, u.t. 68 yrs., g.r. 15*l.*, r. 74*l.*, 630*l.*; 46 and 48, Sandbrook-rd., u.t. 68 yrs., g.r. 10*l.*, r. 56*l.*, 425*l.*; 49, Oldfield-rd., u.t. 68 yrs., g.r. 5*l.*, r. 30*l.* 18s., 245*l.*; 46, Defoe-rd., u.t. 69¾ yrs., g.r. 6*l.*, r. 24*l.*, 230*l.*; 21, Victoria-grove, u.t. 45 yrs., g.r. 5*l.*, r. 24*l.*, 170*l.*; 81, Farleigh-rd., u.t. 69 yrs., g.r. 7*l.*, r. 36*l.*, 340*l.*; 70, London-rd., u.t. 72 yrs., g.r. 7*l.*, r. 36*l.*, 315*l.*; 1 and 2, Providence Cottages, f., 925*l.*; 45 and 47, London-rd., f., r. 58*l.*, 740*l.*; i g.r. of 30*l.*, Hindle-st., Hackney, u.t. 18 yrs., g.r. 8*l.*, 180*l.*; f.g.r. of 10*l.*, Chippendale-st., Clapton, 230*l.*—By *Henry Hooper:* 223, Dalston-lane, Hackney, u.t. 43 yrs., g.r. 4*l.* 16s., 350*l.*; 72, Stowe-rd., Shepherd's Bush, u.t. 72 yrs., g.r. 7*l.* 10s., 195*l.*

MARCH 5.—By *Clarke & Co.:* 12, Baron's Court-rd., Kensington, u.t. 81 yrs., g.r. 12*l.*, r. 65*l.*, 535*l.*—By *Inman Sharp, Harrinton & Roberts:* 72, Scarsdale Villa, Kensington, u.t. 55 yrs., g.r. 1s., 860*l.*—By *Reynolds & Eason:* 56, Charlotte-st., Fitzroy-sq., f. site, area 810 sup. ft., 510*l.*

MARCH 6.—By *Rushworth & Stevens:* 7, Margravine-gardens, Kensington, u.t. 88 yrs., g.r. 7*l.*, 310*l.*; a profit-rental of 13*l.* 10s., New Cut, Lambeth, u.t. 15 yrs., 100*l.*; a profit-rent of 80*l.*, New Cut, u.t. 12½ yrs., 510*l.*; a profit-rent of 124*l.*, New Cut, u.t 12½ yrs., 805*l.*; 1, 2, and 3, Windmill-ct., u.t. 12½ yrs., g.r. 1*l.* 15s. 7½d., 80*l.*; 60, New Cut, u.t. 12 yrs., g.r. 8*l.*, r. 63*l.*, 300*l.*; New Cut, i.g.r. of 14*l.* 8s., sold privately.—By *H. Griffin:* F.g.r. 17*l.* 10s., Knowsley-rd., Battersea, reversion in 74 yrs., 395*l.*

MARCH 7.—By *Newbon & Co.:* 5, Alpha-pl., Highgate, f., 600*l.*; 18, King Edward-rd., Hackney, f., 455*l.*; 7, Bayford-st., u.t. 77 yrs., g.r. 5*l.*, r. 27*l.*, 285*l.*; 55, Approach-rd., Victoria Pk., u.t. 59 yrs., g.r. 6*l.*, r. 40., 390*l.*

MARCH 8.—By *W. W. Jenkinson:* 1 to 7, Victoria-pl., South Lambeth, f., 2,150*l.*; 24, 26, and 28, Priory-grove, f. 900*l.*; 30 and 32, Priory-grove, f., 605*l.*; 34, Priory-grove, and 2, 4, and 6, Priory-mews, f., 970*l.*—By *Wallett & Morris:* two copyhold cottages, Spencer-ct., Wandsworth, 225*l.*—By *T. G. Wharton:* Baldwins Hill, Loughton, and 1 a., f., 365*l.*; 46, D'Eynsford-rd., Camberwell, u.t. 62 yrs., g.r. 3*l.*, 165*l.*; 61 and 63, D'Eynsford-rd., u.t. 60 yrs., g.r. 6*l.*s. 6d., 375*l.*

MARCH 11.—By *Weatherall & Green:* F.g.r. of 60*l.*, St. Leonard's, Hastings, reversion in 71 yrs., 1,720*l.*—By *A. Booth:* 59, St. Augustine's-rd., Camden Town, u.t. 68 yrs., g.r. 5*l.*, 450*l.*—By *J. C. Platt:* 1, Chippenham-rd., Paddington, with goodwill of a baker, u.t. 17 yrs., r. 65*l.*, 100*l.*

MARCH 13.—By *Douglas Young:* 21, Crompton-st., Paddington, u.t. 43 yrs., g.r. 7*l.* 7s., 275*l.*; 11, Domville-grove, Camberwell, u.t. 56 yrs., g.r. 5*l.*, 220*l.*—By *Beal & Myrtle:* F.g.r. of 90*l.*, Carlyle-gardens, Chelsea, reversion in 97 yrs., 2,265*l.*—By *Mullett, Booker & Co.:* 40, Pembridge Villas, Bayswater, f., r. 135*l.*, 2,010*l.*

MARCH 14.—By *Newbon & Co.:* 21 and 23, Lightfoot-rd., Hornsey, f., r. 50*l.*, 570*l.*; 18 and 20, Eastfield-rd., f., 400*l.*; Talbot-rd., Bayswater, i.g.r. of 25*l.*, u.t. 51 yrs., g.r. 16*l.*, 155*l.*; 300, Caledonian-rd., Islington, u.t. 49 yrs., g.r. 5*l.* 11s., r. 50*l.*, 480*l.*; 109, Upper-st., f., r. 40*l.*, 1,210*l.*—By *C. C. & T. Moore:* 141, Antill-rd., Bow, u.t. 67 yrs., g.r. 4*l.* 10s., 180*l.*; Lindley-st., Leyton, f.g.r. of 7*l.*, reversion in 97 yrs., 150*l.*; Wellington-rd., East Ham, three plots of land, f., 55*l.*; Market-st., eight plots of land, f., 125*l.*; 2, Crathorn-st., Lewisham, u.t. 74 yrs., g.r. 10*l.*, r. 55*l.*, 600*l.*; No. 325, Commercial-rd., East, u.t. 43 yrs., g.r. 35*l.*, 300*l.*; 44 and 46, Balaam-st., Plaistow, f., r. 60*l.*, 660*l.*; 79, Summerhill-rd., Tottenham, f. 255*l.*—By *Stimson & Sons:* The Broadway, Tooting, freehold house, shop and builders' premises, 500*l.*; 83, Ethelred-st., Lambeth, u.t. 14 yrs., g.r. 4*l.* 4s., 80*l.*; 2, 3, 9, 14, 15 and 16, Wake-st., u.t. 14 yrs., g.r. 25*l.* 4s., 200*l.*; 6, 7, and 8, Wake-st., u.t. 14 yrs., g.r. 12*l.* 12s., 150*l.*; 33, Appach-rd., Brixton, u.t. 70 yrs., g.r. 7*l.*, 245*l.*; 30A, Anstey-rd., Peckham, u.t. 90 yrs., g.r. 4*l.*, r. 28*l.*, 280*l.*; 32A, Anstey-rd., u.t. 90 yrs., g.r. 5*l.*, r. 28*l.*, 280*l.*; 8, Thornton-ter., u.t. 84 yrs., g.r. 6*l.* 10s., r. 31*l.* 4s., 300*l.*; No. 348, Wandsworth-rd., u.t. 14 yrs., g.r. 6*l.*, 175*l.*; 1, Crichton-st., u.t. 68 yrs., g.r. 5*l.*, r. 28*l.* 12s., 140*l.*; 1, Westbury-st., u.t. 68 yrs., g.r. 5*l.*, r. 26*l.*, 125*l.*; 87, North-st., u.t. 48 yrs., g.r. 4*l.* 10s., r. 33*l.* 16s., 200*l.*; 2, Lillieshall-rd., Clapham, and a ground rent of 39*l.* 8s., u.t. 4 yrs., g.r. 30*l.* 10s., 20*l.*; 59, 61, 63, and 65, Wirtemburg-st., u.t. 13 yrs., g.r. 11*l.* 16s., 420*l.*; 35, Holland-st., Brixton, u.t. 4 yrs., g.r. 1*l.* 10s., r. 28*l.*, 70*l.*; No. 89, Camberwell New-rd., u.t. 6 yrs., g.r. 1*l.*, r. 36*l.*, 90*l.*; i.g.r. of 44*l.*, Allen-st., Old Kent-rd., u.t. 14 yrs., g.r. 9*l.*, 180*l.*

PRICES CURRENT OF MATERIALS.

TIMBER.

Greenheart, B.G. ton	8/0/0	0/0/0
Teak, E.I. ..load	10/0/0	16/0/0
Sequoia, U.S. ft. cu	1/10	2/2
Ash, Canada load	2/15/0	4/0/0
Birch, do.	2/15/0	4/0/0
Elm, do.....	3/10/0	4/15/0
Fir, Dantsic, &c.	1/10/0	3/5/0
Oak, do.....	2/15/0	4/15/0
Canada	5/10/0	7/0/0
Pine, Canada red	2/15/0	3/5/0
Do. Yellow	3/5/0	5/10/0
Lath, Dantsic, fath	4/10/0	5/10/0
St. Petersburg..	5/0/0	6/10/0
Wainscot, Riga, &c., log	3/0/0	5/5/0
Odessa, crown....	3/0/0	5/5/0
Deals, Finland 2nd & 1st std 100	7/0/0	8/10/0
Do. 4th & 3rd ..	7/0/0	8/0/0
Do. Riga	7/0/0	8/0/0
St. Petersburg, 1st yellow ...	9/10/0	12/0/0
Do. 2nd yellow	7/10/0	9/0/0
Do. white	8/0/0	9/10/0
Swedish	7/0/0	15/10/0
White Sea.....	7/10/0	15/0/0
Canada, Pine 1st	21/0/0	24/10/0
Do. do. 2nd....	16/10/0	17/10/0
Do. do. 3rd, &c.	8/0/0	10/5/0
Do. Spruce, 1st..	8/10/0	10/0/0
Do. do. 3rd and 2nd	6/10/0	7/5/0
New Brunswick	6/0/0	7/0/0
Battens, all kinds	5/0/0	21/0/0
Flooring boards, sq., 1 in. prep. 1st.....	0/9/0	0/14/0
Do. 2nd	0/6/6	0/11/0
Other qualities—	0/4/6	0/7/0
Cedar, Cuba ..ft.	/3	/4
Honduras, &c.	/3	/4½
Mahogany, Cuba	/3½	/6
St. Domingo, cargo av.	/3½	1/6
Mexican do. do.	/3	/4
Tobasco do. do.	/3½	/6
Honduras do...	/3½	/5½
Box, Turkey ton	4/0/0	15/0/0
Rose, Rio	7/0/0	16/0/0
Bahia	6/0/0	15/0/0
Satin, St. Domingo	0/0/5	0/1/0

TIMBER (*continued*).

Satin, Porto Rico	0/0/6	0/1/6
Walnut, Italian....	0/0/3½	0/0/7

METALS.

Iron—Pig, in Scotland .....ton	2/1/8½	0/0/0
Bar, Welsh, in London	5/12/6	5/15/0
Do. do. at works in Wales.....	5/2/6	5/5/0
Do. Staffordshire, in London.....	6/0/0	6/10/0
COPPER—British cake and ingot	41/10/0	42/0/0
Best selected ..	42/5/0	42/15/0
Sheets, strong..	49/0/0	0/0/0
Chili bars	39/3/9	39/8/9
YELLOWMETALlb	0/0/4	0/0/4¼
LEAD—Pig, Spanish ....ton	9/16/3	0/0/0
English com. brands	9/17/6	10/0/0
Sheet, English, 6 lbs. per sq. ft. and upwards ..	10/15/0	11/0/0
Pipe	11/15/0	0/0/0
ZINC—English sheet .....ton	18/10/0	19/0/0
Vieille Montagne	19/10/0	0/0/0
TIN—Straits.....	62/5/0	62/15/0
Australian.....	62/10/0	63/0/0
English Ingots.	64/0/0	64/10/0
Banca	60/10/0	60/15/0
Billiton	60/0/0	60/5/0

OILS.

Linseed .....ton	20/0/0	20/7/6
Cocoanut, Cochin	24/15/0	0/0/0
Do. Ceylon	22/15/0	0/0/0
Palm, Lagos	23/0/0	0/0/0
Rapeseed, English pale.....	21/15/0	22/0/0
Do. brown	20/5/0	20/10/0
Cottonseed ref. ..	16/15/0	17/10/0
Oleine.....	19/10/0	21/10/0
Lubricating, U.S.	4/0/0	5/0/0
Do. refined.....	5/0/0	12/0/0
TAR—Stockholm barrel	1/1/0	1/1/6
Archangel.....	0/16/0	0/0/0

TENDERS.

[Communications for insertion under this heading should be addressed to "The Editor," and must reach us *not later than* 10 *a.m. on Thursdays.*]

ABERDEEN.—For the construction of sewers, North Forest-road, and three other streets, Torry, for the Town Council. Mr. George T. Lynam, Assistant Borough Surveyor, Town House, Aberdeen:—

Forest-road.

James Leith £146 13 8

Hardgate and Old Mill-road.

Robt. Gair £52 18 10

Clifton-road.

Alex. McKay £26 5 2

Merkland-road East.

Robt. Gair..... £25 15 1

Queen's-road-lane.

Robt. Gair..... £22 10 2

ABINGDON.—For the supply of 2,690 tons best broken Hartshill stone, for the Highway Board. Mr. C. Tame, District Surveyor, Appleford, near Abingdon:—

	s.	d.	s.	d.	
Chas. Abell, Hartshill Granite Quarries, near Atherstone	10	2 to	10	3	Broken stone.
W. A. Jodkins, Tuttle-hill, Granite Quarries, Nuneaton	9	2 to	9	3	Unbr. ken.
	9	6 to	10	9	Broken.
	8	0 to	9	6	Unbroken.

BACUP (Lancs.).—For the execution of sewerage works, for the Corporation. Mr. John Wilson, C.E., Bacup:—

Brown & Phillips ...	£12,215 2 6	Enoch Tempest, Stafford (accepted)	£9,687 5 7
Richd. Lomax	10,660 8 0		
George Bell	9,327 0 0	Geo. Freeman & Sons.....	8,341 3 0
George Taylor	9,139 12 3		

DEVONPORT.—For alterations and additions to the "Terminus Hotel" for the Plymouth Breweries Co. Mr. H. G. Luff, architect, 64, Chapel-street, Devonport.

Thos. Crews	£716 10	T. Taylor & Son	£505 0
J. G. Jenkin	631 8	Thos. Greenslade & Son, Devonport	495 10
W. Littleton	510 0		

* Accepted.

FORT WILLIAM (N.B.).—For the erection of the "Station Hotel." Mr. Dun Cameron, architect, Inverness. Quantities by Mr. Charles A. Hendery, Inverness:—

Masonry.—J. & J. L. McLachlan, Stirling	£3,828 8 11
Carpentry.—Wm. McDonald, Inverness	2,448 0 0
Slating.—Donald Fraser, Fort William	148 18 4
Blacksmithing.—Rose-street Foundry Co., Inverness	426 9 7
Plumbing.—Anderson & Nisbet, Oban	595 9 1
Plastering.—Fowler & Kennedy, Inverness....	896 0 0
Painting and Glazing.—Donald McDonald, Inverness.....	495 0 0
Total	8,840 5 11

GREAT WYRLEY (Staffs.).—Accepted for additions, &c., to schools at Great Wyrley and at Cheslyn Hay, for the United District School Board. Messrs. Bailey & McConnal, architects, Bridge-street, Walsall:—

Cheslyn Hay.—Anderson, Cannock	£1,890
Great Wyrley.—Wootton, Bloxwich	1,484

GREAT YARMOUTH.—For the construction of a large beer-cellar (330 ft. by 160 ft.), North Quay, for Messrs. E. Lacon & Co. Mr. James E. Teasdel, C.E., 3, Queen-street, Great Yarmouth:—

R. Eastoe	£11,146 4	J. F. W. Bray (amended price)	£9,598 0
G. Beckett	10,827 0		
T. Howes	9,991 0	W. Cork, Caistor-road, Yarmouth (accepted)	9,545 0
J. W. Cockrill & Sons (amended price)	9,969 0	M. Barnard	9,046 0
		Bead & Curtis	8,495 0

GREAT YARMOUTH.—For concreting and kerbing footways, for the Urban Sanitary Authority. Mr. J. W. Cockrill, C.E., Borough Surveyor, Town Hall, Great Yarmouth. Quantities by Borough Surveyor:—

W. Wadey.....	£2,275 0 0	Wiseman	£1,325 0 0
Patent Paving and Construction Co...	1,700 0 0	Barnard	1,279 18 5
		Hindley & Co.....	1,204 10 0
Ellis & Sons.....	1,696 12 0	Adamson	1,190 0 0
Cork	1,658 0 0	Bracey	1,184 15 0
W. B. Wilkinson....	1,640 0 0	Bray	1,168 0 0
Beech	1,430 10 0	Thompson, Yarmouth*	1,117 0 0

* Accepted.

GUILDFORD.—For making-up, &c., Sandfield-terrace. Mr F. T. Maltby, C.E., Borough Surveyor, Tun's Gate, Guildford:—

G. A. Franks	£261 12 0	S. Kavanah, Tolworth, Surbiton (accepted)	£237 17 2

[Borough Surveyor's Estimate, £235.]

HENLEY-IN-ARDEN. — For works in connexion with the Henley-in-Arden Waterworks. Mr. J. E. Willcox, engineer, 63, Temple-row, Birmingham:—

Contract No. 1.—For Cast-iron Pipes.

Currall & Lewis.....	£994 6 10	Alfred Williams & Co.	£954 19 6
James Oakes & Co. ..	981 8 0		
Clay Cross Co.....	974 2 3	Stanton Iron Co., Nottingham*	946 8 9
Cochrane & Co.....	963 14 3		
Staveley Iron Co.....	957 7 6	J. & S. Roberts	924 0 0

* Accepted.

[Engineer's estimate, £960.]

Contracts Nos. 2 and 3.—Laying water-mains, and construction of service reservoir. Sewage and sewage-disposal works.

H. Law	£1,013 12 0		£1,805 0 0
G. Trentham	1,113 0 0		1,846 0 0
B. Griffin, Henley-in-Arden *	1,125 0 0		1,898 15 2
G. Law.....	1,218 0 0		1,810 0 0
Siddons & Freeman	1,125 0 0		1,970 0 0
H. Holloway	1,195 0 0		1,990 0 0
J. Roberts	1,290 0 0		2,190 0 0
S. Wood	1,190 0 0		2,200 0 0
Currall & Lewis	1,317 17 4		2,158 11 0
Jones & Fitzmaurice	1,240 0 0		2,347 0 0
H. Weldon	1,502 16 10		2,685 5 0
J. Biggs	1,299 0 0		2,299 0 0
Cruwys & Hobrough.....	1,416 0 0		2,270 0 0
G. Bell.....	1,263 0 0		2,594 0 0
J. Mackay	1,486 13 3		2,403 0 0
J. F. Price	1,553 16 0		2,540 0 0
E. Tempe st	1,815 13 6		2,523 16 3
J. White, junr.	2,032 5 0		2,544 4 4
H. Shardlow.....	1,421 0 0		3,820 0 0
A. Jenkins.....	1,210 0 0		—
Wyatt Bros.	1,359 0 0		—
Alfred Williams & Co.	1,849 15 2		—
A. H. Goff.....	—		1,527 0 0
C. Hardy	—		3,039 9 10
Engineer's Estimate	1,259 0 0		1,871 0 0

* Accepted for both Contracts.

NOTE.—A schedule of prices for house drainage works accompanied tenders for Contract No. 3, Mr. Griffin's tender being the lowest.

HARWICH.—For the erection of infants' school, boundary-walls, water-closets, &c., at Lower Dovercourt, for the Harwich School Board. Mr. J. W. Start, F.S.I., architect, Colchester, Clacton-on-Sea, and Harwich. Quantities by the architect:—

Girling & Coe	£1,950 0 0	R. Beaumont	£1,695 0 0
G. Dobson	1,885 0 0	Moran & Son	1,590 0 0
Smith, Beaumont, & Dawson	1,863 18 0	E. Saunders, Dover-court (accepted) ..	1,477 0 0
E. West.....	1,700 0 0		

[Extra for glazed brick dado to lavatory and match-boarded dado to schools, £32 18s. 6d.]

HULL.—For the erection of shops and houses, Holderness-road, for the Trustees of the Lairgate Congregational Church Endowment, Beverley Mr. Geo. S. Hird, architect. Quantities by architect:—

Hewitt	£1,246 14 8	Sayner	£1,025 12 0
Nicholson	1,053 17 8	Scott	997 14 6
Hodgson	1,052 0 0	Hocking & Siggins	990 0 0
Goates, Thos.....	1,050 0 0	Colley & Swift	912 15 0
Harper	1,046 0 0	Woods	944 0 0
Darnley, A. J. & Son	1,034 11 0	Singleton*	903 4 6

[All of Hull.]

* Accepted.

ILFORD.—For new Wesleyan Methodist Church in the High-street, Ilford, Essex, for the Building Committee of the same. Mr. J. H. Carte, architect, Upton-park, Essex. Quantities supplied by Mr. Henry Theobald, 48, Finsbury-pavement, E.C.:—

J. Pappin	£3,954	Geo. Sharpe, Stratford*	£3,910
W. Watson	3,928		

* Accepted, including certain additional work, at £4,030

ISLE OF WIGHT.—Accepted for building new dining-room, &c., at Nunwell, Isle of Wight, for Mr. J. H. Oglander, J.P. Mr. John I. Barton, architect and surveyor, Ryde:—

C. Langdon, Ryde £632

[No competition.]

KING'S LYNN.—For the erection of a warehouse, Alexandra Dock, for the Docks and Railway Company. Mr. F. Valentine, engineer, King Staith-square, King's Lynn:—

J. Youngs & Sons	£4,965	Bardell Bros.	£4 690
C. Kidman	4,951	R. Dye, King's Lynn*	4 378
W. H. Brown	4,848		

* Accepted.

KINGSTON (Surrey).—For alterations and putting in new shop-front to the Leopold Tavern, Clarence-street, for Mr. Sedley Taylor, M.A. G. S. Strevens, architect:—

G. Meredew..... £226 | G. Wales £220

KIRKBY STEPHEN (Westmoreland).—For additions, &c., to Eden Place, for Lieut.-Col. Mason. Mr. Robert Walker, architect, Windermere:—

Masonry, Walling, &c. — Harrison, Kirkby Stephen..... }
Joinery.—Smith & Bonson, Kirkby Stephen .... }
Plumbing.—F. Thornton, Kirkby Stephen ..... } £2,000
Plastering.—Armstrong, Kirkby Stephen..... }
Painting.—Brunskell & Nicholson, Kirkby Stephen..... }
Slating.—J. Bailey, Penrith ..... }

LEYTONSTONE.—For the erection of the Fillebrooke Livery Stables and Coachhouses, Grove Green-lane, for Mr. James Powell. Mr. J. Williams Dunford, architect, 10C, Queen Victoria-street, E.C.:—

F. J. Coxhead	£1,285	E. Good.....	£1,086
Fuller & Son	1,187	A. G. Barton, Walthamstow (accepted)	1,003
Smith & Co.....	1,167		

[Architect's covering estimate, £1,015.]

LONDON.—For decorations, &c., at 139, Haverstock Hill, for Mr. W. Searle. Mr. T. Wilson, surveyor, 34, New Bridge-street, E.C.:—

C. Peek, Hornsey	£163 0	J. Pugh, Belsize Park* ..	£148 0
W. Sumner & Co., Ltd.	149 10		

* Accepted.

LONDON.—For the erection of a block of school buildings (Water-lane schools), Stratford, for the West Ham School Board. Messrs. J. T. Newman & Jacques, architects, 2, Fen-court, Fenchurch-street, E.C.:—

J. Potter	£22,765	Reed & Son	£17,996
Stimpson & Co.	19,900	Girling & Co.....	17,841
H. J. Carter	19,218	W. J. Maddison	17,534
C. Gray Hill	18,880	Gregar & Son, Stratford*	17,320
Lorden & Son	18,489	Kirk, Knight & Co.	17,100
Hearle & Farrow.....	18,125		

* Accepted subject to the approval of the Education Department.

LONDON.—For making-up and paving Burnfoot-avenue, Sec. I., for the Vestry of Fulham. Mr. Charles Botterill, Engineer and Surveyor:—

	Road-way.	York-stone.	Victoria-stone.	Imperial-stone.
	£	£	£	£
Imperial Stone Co., East Greenwich.....	—	—	—	99
Victoria Stone Co., Kingsland	—	—	110	—
Nowell & Robson, Kensington	176	136	—	—
Greenham, Hammersmith.....	190	—	—	—
Mears, Earl's Court.....	155	—	—	—

LONDON.—For alterations and additions to Nos. 187 and 191, and for re-building No. 189, Walworth-road, S.E., for Mr. Hyams. Messrs. Barnes, Williams, Ford, & Griffin, architects:—

Pritchard & Renwick	£1,570	F. Tarrant	£1,460
Peacock Bros.....	1,548	Jarvis & Sons	1,429
Marsland	1,486	A. White & Co.	1,419
Shepherd	1,482		

LONDON.—For house to be erected on the Belgravia Estate, Limited. Mr. Dunn Carmichael, architect:—

Stephens, Bastow, & Co., Bristol £2,500

LONDON.—For the enlargement of the Clerkenwell Fire Brigade Station, for the London County Council:—

J. Shillitoe & Son	£8,163	Holloway Bros.	£6,827
Thompson & Beveridge..	7,245	G. Munday & Son	6,690
F. Lough & Co.....	7,194		

LONDON.—For the supply of a new sludge-loading pipe, etc., at Barking Outfall Works, for the London County Council:—

Thames Ironworks Co., Ltd.	£2,007 8 2	Phœnix Foundry Co., Ltd.	£1,586 6 1
R. Moreland & Son	1,830 0 0	Glenfield Co., Ltd.	1,577 3 6
		J. Lysaght, Ltd.....	1,374 13 0

LONDON.—For external painting and repairs required to be done at the Licensed Victuallers' Asylum, Asylum-road, Old Kent-road, London. Mr. W. F. Potter, architect. Quantities prepared by Mr. C. R. Griffiths, 31, Furnival-street, Holborn, E.C.

W. H. Collings & Co. £1,049		Pritchard & Renwick	579
W. Smith	821	H. H. Hollingsworth	559
J. Walker	694	S. Hayworth & Sons, Kingsland*	497
F. Dawes	595		

*Accepted.

MAESTEG (Wales).—For additions to the Oakwood Schools, for the Cwmdu and Llangynwyd Higher School Board. Mr. E. W. Burnett, architect, Tondu, near Bridgend:—

D. Jones & Co.	£1,478	J. Rees	£1,367
P. Gaylard	1,385	E. Evans, Maesteg*	1,214

* Accepted.

PETERBOROUGH.—For the erection of two dwelling-houses, Bamber-street. Mr. J. G. Stallebrass, architect, North-street, Peterborough:—

Bridgefoot	£502 0	Cracknell	£449 12
Watson & Spriggs	498 0	Sibley	442 0
Jellings	479 0	Wenlock	420 0
Bailey	470 0	Guttridge (accepted)	415 0
Gray	469 0	Pape	405 0

[All of Peterborough.]

PUTNEY.—Accepted for alterations and shop-fitting at 29, High-street, Putney, S.W. Mr. W. Turner, architect:—
W. Marks £283 9

ROCHDALE.—For the construction of sewage purification works, Tonacliffe, for the Whitworth Urban District Council. Mr. H. Leonard Hinnell, C.E., 15, Mawdsley-street, Bolton:—
Thomas Taylor, 59, King's-road, Rochdale.
[As per schedule of prices.]

ROMFORD.—For pulling down and rebuilding the "Coach and Bell" Inn, High-street, Romford, for Messrs. Goodchild Brothers. Mr. Arthur T. G. Woods, architect, Brentwood:—

Dousing & Davis	£2,155	J. S. Hamnow & Sons, Romford (accepted)	£2,065
Rogers & Robson	2,105		

SHEFFIELD.—For extensions to the Court-house, between Waingate and Castle-green, for the Watch Committee. Messrs. Flockton & Gibbs, architects, 15, St. James'-row, Sheffield:—

John Morton	£16,917	Fredk. Ives	£15,938
T. Lowe & Sons	16,800	Ash, Son, & Biggin	15,780
G. Longden & Son	16,200		

Masonry.—J. Fidler, Eckington* £8,895 0
Joinery.—J. H. Lilleker, Sheffield* 4,105 12
Plumbing.—J. B. Corrie & Sons, Sheffield* 1,120 10
Plastering and Slating.—C. Chadwick & Son, Sheffield* 375 0
Ironfounding.—Carter Bros. & Co., Manchester* 788 0
£15,284 2

* Accepted.

SOUTHPORT.—For additions to engine- and boiler-house, electricity works, Crowlands, for the Corporation. Mr. Crabtree, Borough Surveyor, Southport:—

Section 1.
Brickwork, &c.—Herbert Connard, Southport .. 564 0 0
Section 2.
Joinery, &c.—J. Blanchard & Sons, Southport .. 541 0 0
Section 3.
Ironwork.—Edward Wood, Manchester 663 0 0

TWICKENHAM.—Accepted for repairs and decorations to Poulett Lodge, Cross Deep, Twickenham, for Mr. P. B. Burgoyne. Mr. Walter J. Ebbetts, architect, Savoy House, 115, Strand, W.C.:—
Foord & Son, Brentford £873 15
For Internal Sanitary works.
Foord & Son, Brentford £125 12
For External Sanitary works.
Foord & Son, Brentford £191

WALTHAMSTOW.—For the erecton of a dwelling-house and coach-builder's premises, Markhouse-road. Mr. Jasper J. Kelf, architect, 26, High-street, Walthamstow.

Morrison & Goodwin	£661 0	Dartnall Bros	£535 0
Thompson	640 0	Burdock, Leyton*	533 15
Rawlins & Turner	559 0		

*Accepted.

WELLS (Somerset).—For the erection of a cottage hospital, for the Committee. Mr. Wm. Jno. Willcox, architect, 1, Belmont, Bath:—

Bird	£2,050 0 0	Lovell & Sons	£1,796 15 0
Forse	1,998 0 0	Hatherley & Carr	1,785 0 0
Bray	1,998 0 0	Huish	1,782 16 9
Long & Sons	1,873 0 0	Sales Cook	1,700 0 0
Cock & Ford	1,860 0 0	Merrick	1,698 0 0
Francis	1,800 0 0	Stead	1,687 0 0
Love	1,799 0 0	Wibley, Bath*	1,684 12 0
Hayward & Wooster	1,797 0 0		

* Accepted.

WIMBLEDON.—Accepted for the erection of house and stables in Alwyn-road, Wimbledon. Mr. Robert J. Thomson, architect and surveyor, Hill-road, Wimbledon, S.W.:—
S. T. Bonnet, Watford £1,091
[No competition.]

WOODFORD.—For the erection of the Catholic Church and Franciscan Friary of St Thomas, for the Dowager Duchess of Newcastle. The Very Rev. Alexander Canon Scoles, architect:—

Nightingale	£10,200	J. Jolliffe	£9,700
Harley & Sons	9,990	Watson	9,190
Minter	9,750	Goddard & Sons	8,870
D. Chateris	9,740	Wells & Sons	8,545
Wetherill, Lee, & Martin	9,713		

SUBSCRIBERS in LONDON and the SUBURBS, by prepaying at the Publishing Office, 19s. per annum (or 4s. 9d. per quarter), can ensure receiving "The Builder," by *Friday Morning's Post.*

TO CORRESPONDENTS.

S. S.—M. S. G. (amounts should have been stated).—R. M. (below our limit).

We are compelled to decline pointing out books and giving addresses.

NOTE.—**The responsibility of signed articles, and papers read at public meetings, rests, of course, with the authors.**

We cannot undertake to return rejected communications.

Letters or communications (beyond mere news items) which have been duplicated for other journals are NOT DESIRED.

All communications regarding literary and artistic matters should be addressed to THE EDITOR; those relating to advertisements and other exclusively business matters should be addressed to THE PUBLISHER, and *not* to the Editor.

PUBLISHER'S NOTICES.

Registered Telegraphic Address, 'THE BUILDER,' LONDON.

CHARGES FOR ADVERTISEMENTS.

SITUATIONS VACANT, PARTNERSHIPS, APPRENTICESHIPS, TRADE AND GENERAL ADVERTISEMENTS.

Six lines (about fifty words) or under ..... 4s. 6d.
Each additional line (about ten words) ..... 0s. 6d.

Terms for series of Trade advertisements, also for Special Advertisements on front page, Competitions, Contracts, Sales by Auction, &c., may be obtained on application to the Publisher.

SITUATIONS WANTED.

FOUR Lines (about thirty words) or under..... 2s. 6d.
Each additional line (about ten words) ..... 0s. 6d.

PREPAYMENT IS ABSOLUTELY NECESSARY.

*** Stamps *must not* be sent, but all small sums should be remitted by Cash in Registered Letter or by Postal Orders, payable to DOUGLAS FOURDRINIER, and addressed to the Publisher of "THE BUILDER," No. 46, Catherine-street, W.C.

Advertisements for the current week's issue are received up to THREE o'clock p.m. on THURSDAY, but "Classification" cannot be guaranteed for any which may reach the Office after HALF-PAST ONE p.m. on that day. Those intended for the front Page should be in by TWELVE noon on WEDNESDAY.

SPECIAL.—ALTERATIONS IN STANDING ADVERTISEMENTS or ORDERS TO DISCONTINUE same must reach the Office before 10 a.m. on WEDNESDAY MORNING.

The Publisher cannot be responsible for DRAWINGS, TESTIMONIALS, &c., left at the Office in reply to advertisements, and strongly recommends that of the latter COPIES ONLY should be sent.

PERSONS Advertising in "The Builder," may have *Replies addressed to the Office,* 46, Catherine-street, Covent Garden, W.C., *free of charge.* Letters will be forwarded if addressed envelopes are sent, together with sufficient stamps to cover the postage.

AN EDITION Printed on THIN PAPER, for FOREIGN and COLONIAL CIRCULATION, is issued every week.

READING CASES, { NINEPENCE EACH. By Post (carefully packed), 1s.

TERMS OF SUBSCRIPTION.

"THE BUILDER" is supplied DIRECT from the Office to residents in any part of the United Kingdom, at the rate of 19s. per annum PREPAID. To all parts of Europe, America, Australia, New Zealand, India, China, Ceylon, &c., 26s. per annum. Remittances (payable to DOUGLAS FOURDRINIER) should be addressed to the publisher of "THE BUILDER," No. 46, Catherine-street, W.C.

ESTABLISHED 1866.

J. J. ETRIDGE, Jr.

SLATE MERCHANT,

SLATER and TILER.

ESTIMATES GIVEN FOR

SLATING AND TILING,

To be Executed by Contract in any part of ENGLAND.

Penrhyn - Bangor,
Oakeley - Palmerston,

And other description of Slates ready for immediate delivery to any Railway Station.

Applications for Prices, &c., to
BETHNAL GREEN SLATE WORKS,
BETHNAL GREEN, LONDON, E.

THE BATH STONE FIRMS, Ltd.
BATH,
FOR ALL THE PROVED KINDS OF
BATH STONE.
FLUATE, for Hardening, Waterproofing, and Preserving Building Materials.

HAM HILL STONE:

The attention of Architects is specially invited to the durability and beautiful COLOUR of this material. Quarries well opened. Quick despatch guaranteed. Stonework delivered and fixed complete. Samples and estimates free. Address, The Ham Hill Stone Co., Norton, Stoke-under-Ham, Somerset. London Agent: Mr. E. A. Williams, 16, Craven-st., Strand, W.C. [ADVT.

Asphalte.—The Seyssel and Metallic Lava Asphalte Company (Mr. H. Glenn), Office, 42, Poultry, E.C.—The best and cheapest materials for damp courses, railway arches, warehouse floors, flat roofs, stables, cow-sheds and milk-rooms, granaries, tun-rooms, and terraces. Asphalte Contractors to the Forth Bridge Co. [ADVT.

SPRAGUE & CO.
LITHOGRAPHERS AND PRINTERS.
Estate Plans and Particulars of Sale promptly executed.
4 & 5, East Harding-st., Fetter-lane, E.C. [ADVT.

QUANTITIES, &c., LITHOGRAPHED accurately and with despatch.
METCHIM & SON, 20, Parliament-st. S.W.
"QUANTITY SURVEYORS' TABLES AND DIARY, For 1895, price 6d. post 7d. In leather 1/- Post 1/1 [ADVT.

THE
French Asphalte
COMPANY,
Suffolk House, Cannon-street, E.C.
SUPPLY THE BEST MATERIAL AND WORKMANSHIP FOR BUILDINGS, DAMP COURSES, AREAS, ROOFS, WASH-HOUSE AND DAIRY FLOORS, &c., &c.

This Asphalte was chosen to be laid at Sandringham, on the new General Post Office, and other important buildings.

TWELVE GOLD AND SILVER MEDALS AWARDED.

IRON CISTERNS.

F. BRABY & CO.

VERY PROMPT SUPPLY.

LARGE STOCK READY.

Particulars on application.

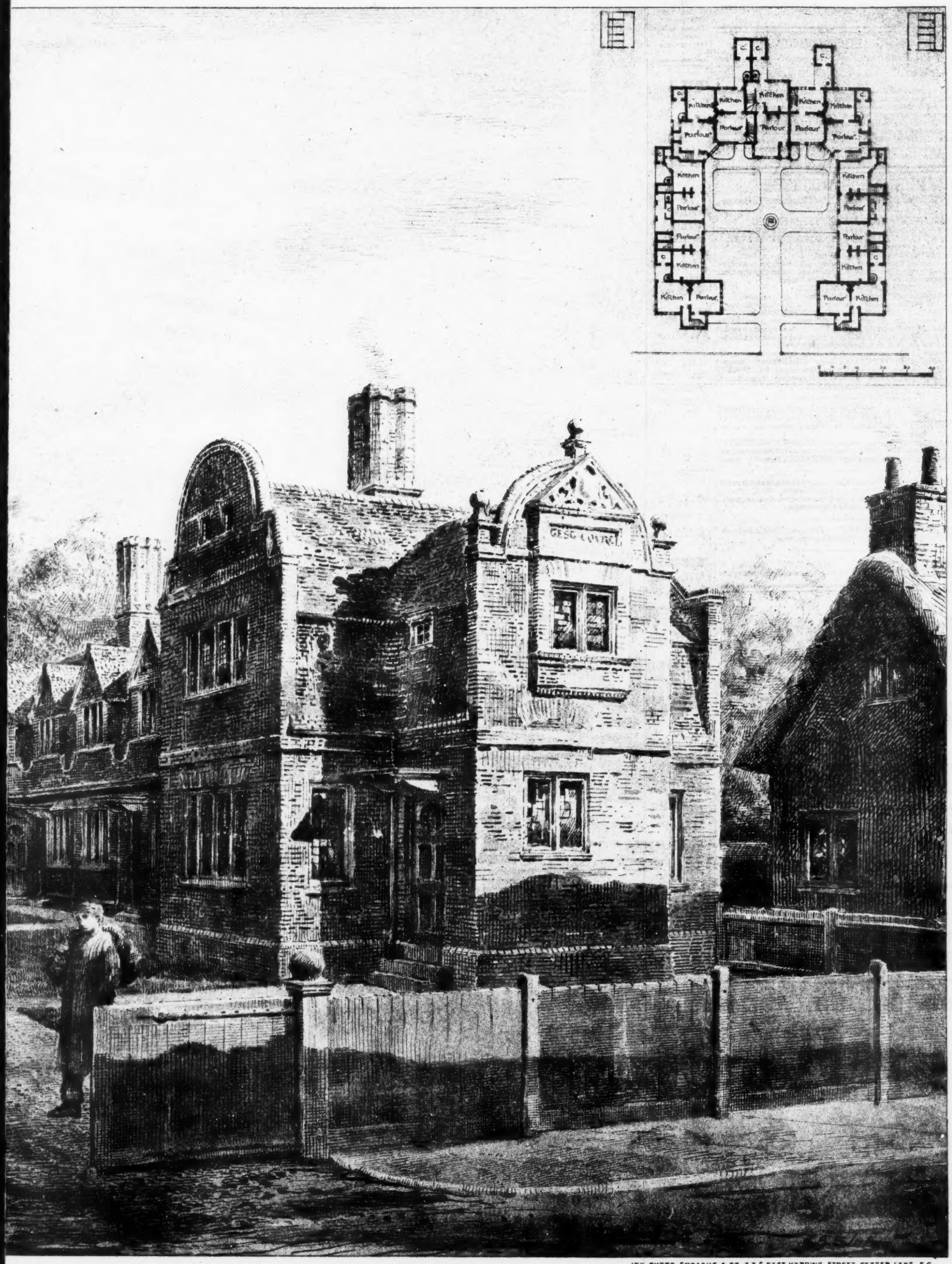
CYLINDERS FOR HOT-WATER CIRCULATION.

LONDON:
352 to 364, EUSTON-ROAD N.W., and
218 and 220, HIGH-STREET, BOROUGH, S.E.

LIVERPOOL:
6 and 8, HATTON GARDEN.

GLASGOW:
47 and 49, ST. ENOCH-SQUARE.

"Test Court."
Chilbolton, Hants.
W. D. Caröe M.A. Architect.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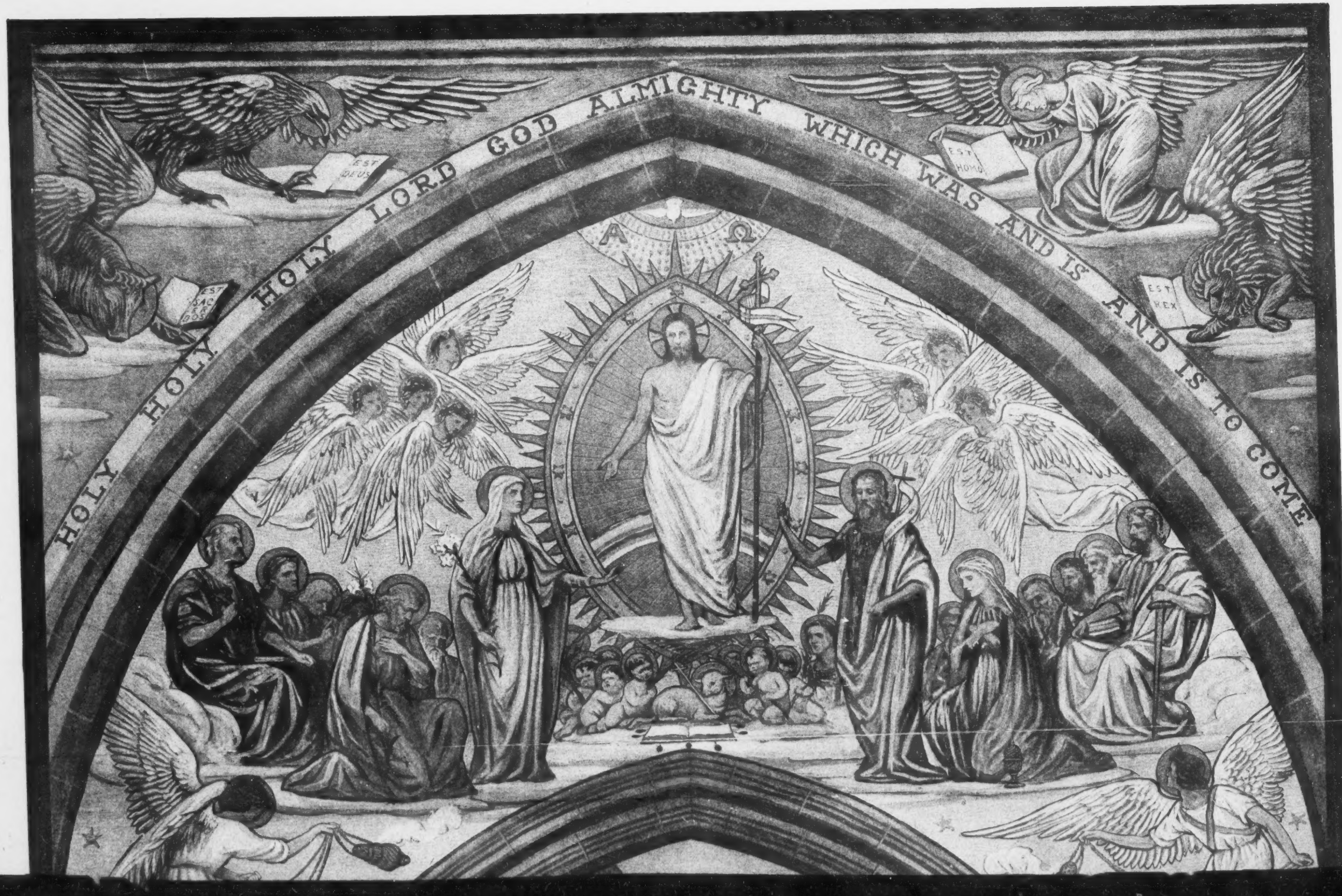
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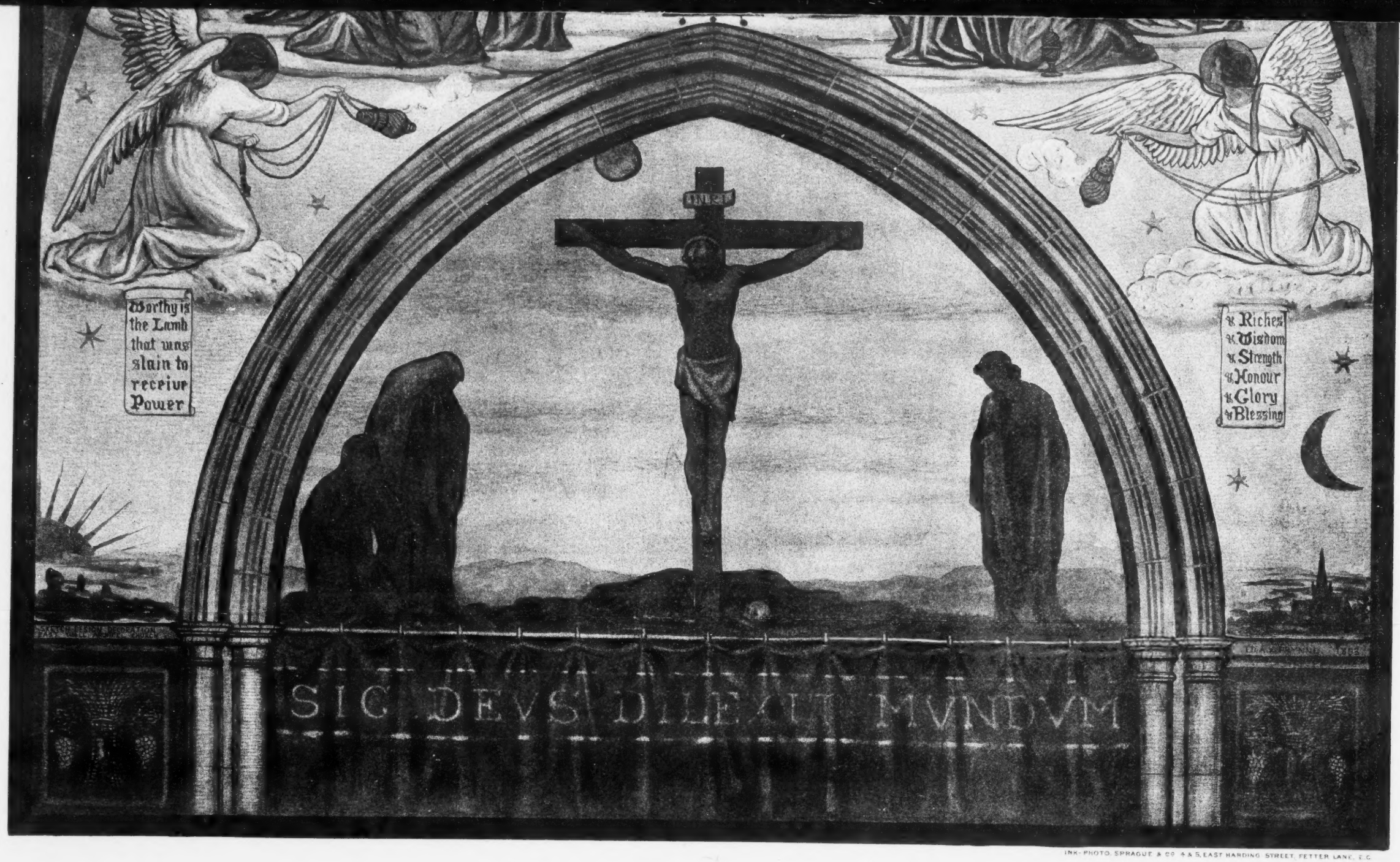
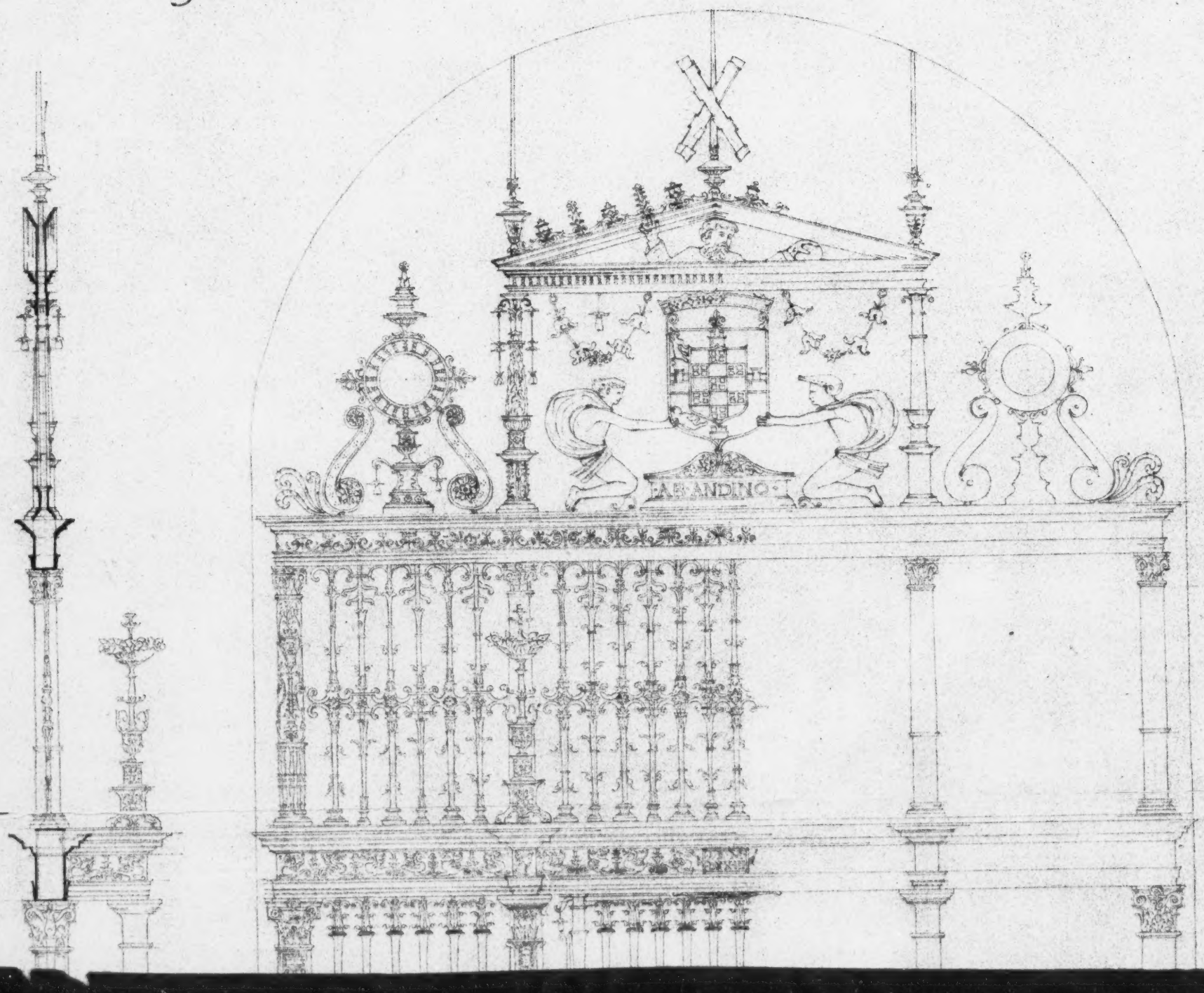


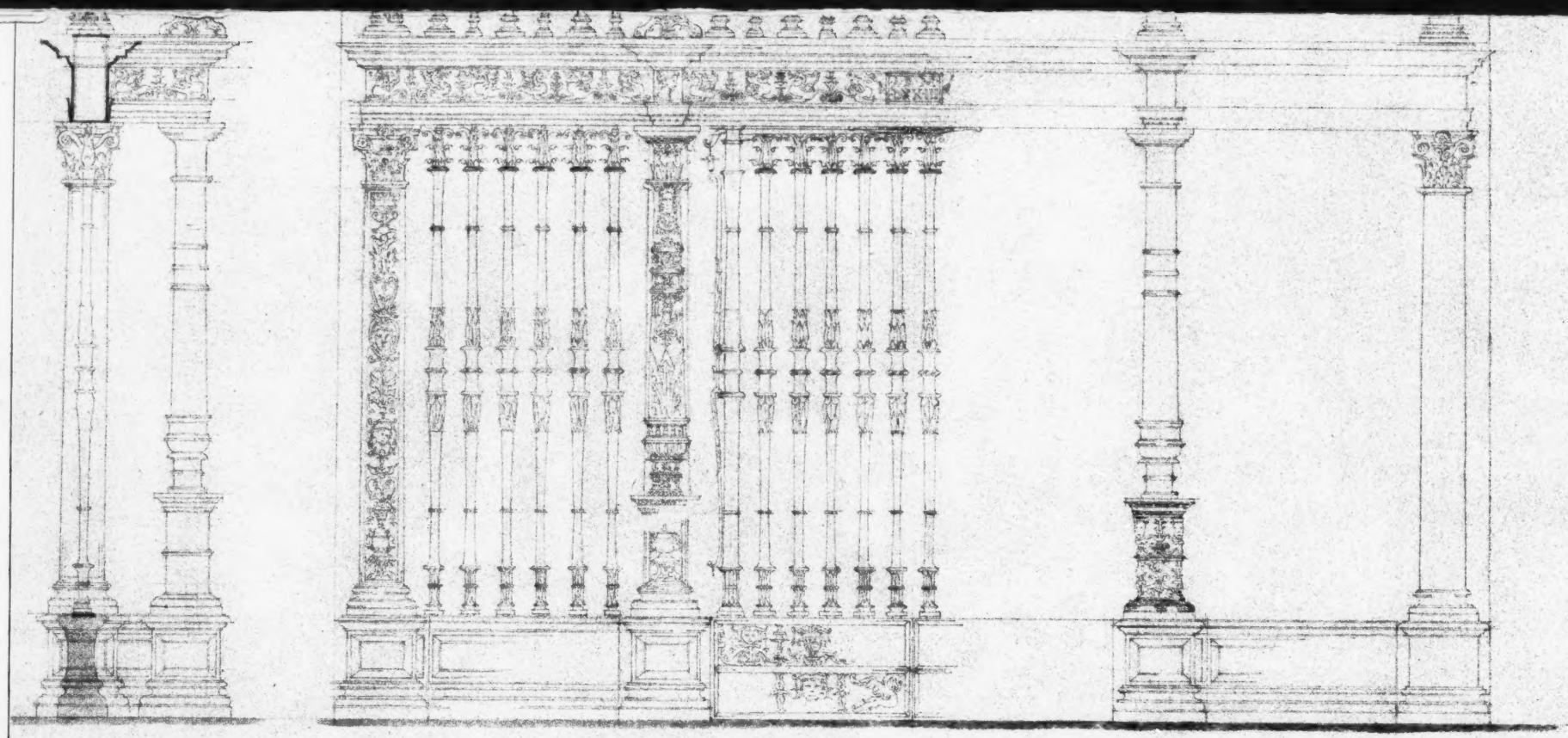
INK-PHOTO. SPRAGUE & CO. 4 & 5, EAST HARDING STREET, FETTER LANE, E.C.

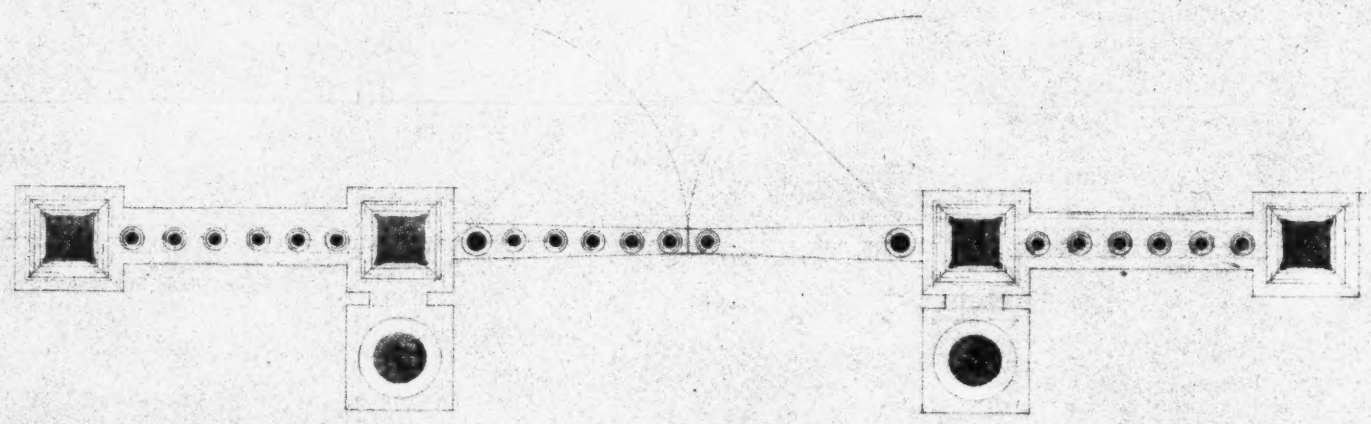
EAST END DECORATION, ARUNDEL CHURCH.—Designed by Mr. E. A. Fellowes Prynne.

Burgos Cathedral : Cahilla del Condestable.

Reja in Wrought Iron



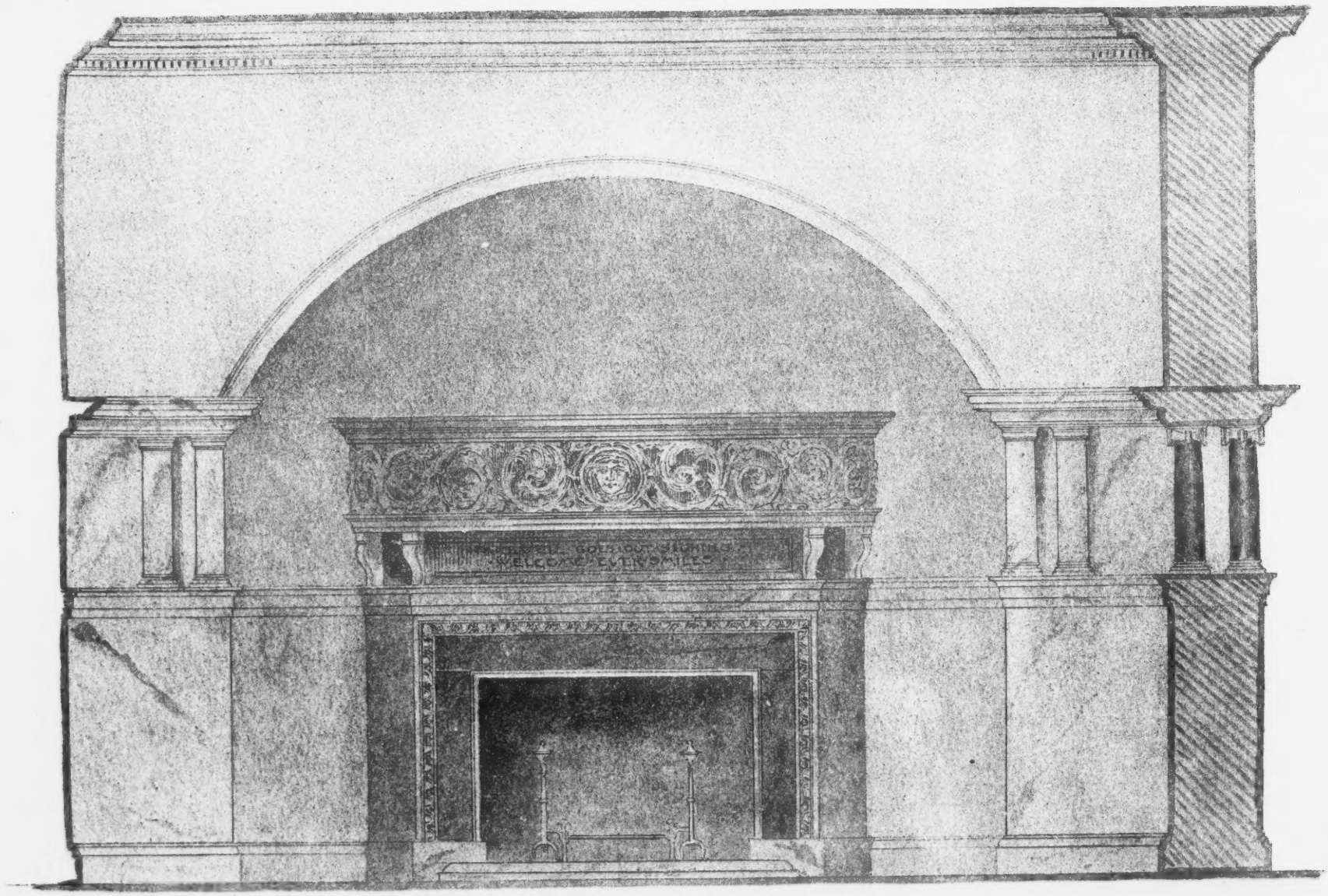




Scale 0 1 2 3 4 5 10 Feet.

Bajo. Capilla del Condestable.
Burgos Cathedral.
Drawn by Juan Gil de Hontañón 1523.
Arthur J Bolton del. F. Inc. 1923. SMT.

INX PHOTO SPRAGUE & Co 4 & 5 EAST HARDING STREET FETTER LANE E.C.



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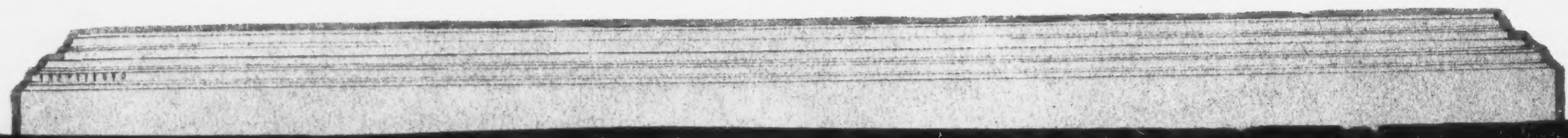

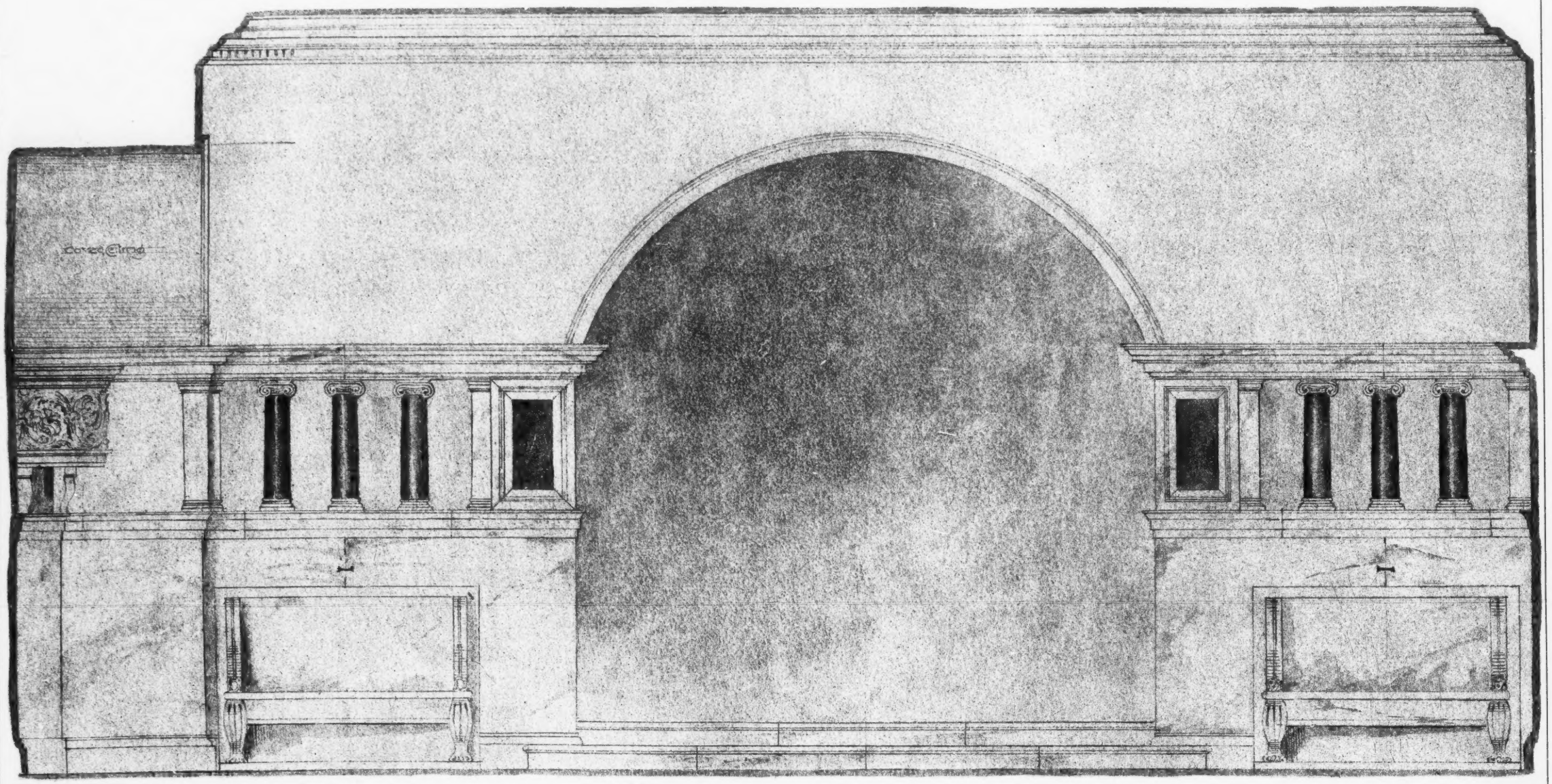

Side Elevation

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H. Seton Morris

INK-PHOTO. SPRAGUE & CO. 4 & 5, EAST HARDING STREET, FETTER LANE, E.C.

DESIGN FOR AN ENTRANCE HALL.—By Mr. H. Seton Morris.

Prize Design, Upper Architectural Schools, Royal Academy.